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Master Thesis

Examining the subject:

Empowering entrepreneurial mindsets - The modern era of incubation

A qualitative analysis of the entrepreneurial support environment at German universities

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Abstract

Over the past few decades, there has been an increasing amount of academic literature recognizing the significance of innovation systems. Entrepreneurship is an important component of an innovation system, contributing to the enhancement of regional as well as national innovation. The transfer of knowledge and technology between science and the economy has become particularly important to reinforce overall innovation performance. Today, universities and other institutions of higher education play a crucial role in the system of innovation and have evolved as active and highly relevant participants in the innovation system. Therefore, various supportive measures have been developed to increase the level of innovation at universities and to drive entrepreneurial activities. However, due to the ever-growing entrepreneurial support environment and the great variety of support programs, the distinction between support measures has become unclear. Consequently, the main objective of the present research work is to contribute to the overall understanding of supportive measures at German universities and other institutions of higher education.

Eight experts were interviewed to ensure the compilation of meaningful data. The research findings highlight the importance of a solid network of external experts as well as collaboration with other entrepreneurial institutions. Moreover, the research results indicated that an organizational structure with decentralized decision-making processes and a greater scope of actions enhances operational efficiency. While considering the indistinctness of different support programs and specific terms, although some significant differences were evaluated, overall, the results present a clear tendency toward a more cautious use of specialist terms, therefore substantiating the missing preciseness.

Keywords: Entrepreneurship, Start-up, Entrepreneurial Support Environment, German Start-up Ecosystem, Incubator, University

Statutory Declaration

I hereby confirm that my thesis entitled "*Empowering entrepreneurial mindsets - The modern era of incubation. A qualitative analysis of the entrepreneurial support environment at German universities"* is the result of my own work. I did not receive any help or support from commercial consultants. All sources and / or materials applied are listed and specified in the thesis.

Furthermore, I confirm that this thesis has not yet been submitted as part of another examination process neither in identical nor in similar form.

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Place, Date Signature

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List of Abbreviations

AI	Artificial Intelligence
AR	Augmented Reality
BMWi	Federal Ministry for Economic Affairs and Energy
C	Category
DIY	Do-it-yourself
GEM	Global Entrepreneurship Monitor
HEI	Higher Educational Institutions
I	Interview
IT	Information Technology
NECI	National Entrepreneurship Context Index
NIS	National Innovation System
NRW	North Rhine-Westphalia
OECD	Organization for Economic Cooperation and Development
R&D	Research and Development
RKW	German Economic Center of Rationalization and Innovation
VC	Venture Capital
VR	Virtual Reality
ZEW	Leibniz Centre for European Economic Research

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1. Introduction

Throughout the past few decades, the field of entrepreneurship has become increasingly important and has proved to be an essential driver of innovation. There is a growing body of literature recognizing the importance of entrepreneurship and the significance of new innovative approaches, as strong innovativeness impels economic as well as social development and stimulates the growth of prosperity in an economy (Ribeiro-Soriano 2017, p. 1).

Nevertheless, the process of innovation consists of various components and represents a dynamic and intricately interconnected system. Therefore, the overall performance of innovation is dependent on the interaction among organizational institutions operating in an economy (Edquist 1997, p. 1). Over the past decades, the field of entrepreneurship and especially the transfer of technology and knowledge between science and industry has become a central issue (Carlsson et al. 2002, p. 234). Accordingly, higher educational intuitions (HEI) became an indispensable component in the system of innovation. Therefore, many innovation and entrepreneurship centers have been established close to universities (OECD 1997, p. 14), representing and operating as innovation intermediaries (Clark 2014, p. 10).

Consequently, universities must sensitize, educate, and exemplify entrepreneurial opportunities to increase the motivation and interest in the field of entrepreneurship (Bundesministerium für Bidlung und Forschung 2017, p. 4). Due to increased awareness of the importance of entrepreneurship on the part of German government and economic leaders, there has been tremendous growth over the past decade in entrepreneurial support measures. Despite the favorable growth of the entrepreneurial ecosystem, the corresponding support environment has become increasingly more intricate and complex due to the growing diversity of supportive measures (Zinke et al. 2018, p. 16).

Therefore, important differentiation factors and criteria that are necessary to guarantee the comprehensibility and appropriateness of various support activities have become indistinct. As a result, the structure as well as the design, performance attributes, and the focal point of support measures for incubators, accelerators, or makerspaces leave too much room for interpretation. Due to the lack of conceptual clarity, the suitability and adequacy of the support environment decreases and the search process for an appropriate support program for potential entrepreneurs and start-ups increases (Zinke et al. 2018, pp. 16–17).

As a result of the ever-growing start-up ecosystem in Germany, a substantial amount of academic literature has been published on this issue. Although extensive research has been conducted, much uncertainty still exists. Therefore, the lack of conceptual clarity remains throughout the literature. Consequently, the main objective of the present research work is to contribute to the overall understanding of various supportive measures. The aim is to analyze the support environment at German universities and HEIs by examining various support structures and important organizational elements and thereby exposing critical distinctions between support concepts, primarily focusing on the incubator concept. Furthermore, salient factors contributing to the overall success of entrepreneurial institutions at universities as well as the driving factors for entrepreneurial motivation on campus will be evaluated. Referring to the purpose of this paper, the present study is premised on a qualitative research base to gain significant and meaningful data and to gather in-depth knowledge concerning the entrepreneurial support environment at the respective university or HEI. Therefore, primary data was gathered through expert interviews.

The remaining part of the present research work proceeds as follows: The next chapter lays out the theoretical dimensions of the present research work outlining the evolutionary view of innovation as well as the main components of an innovation system, primarily focusing on the national innovation system. Moreover, important terms will be discussed, building the necessary basis for the present research work. The third chapter provides a general overview of the start-up ecosystem in Germany by analyzing the overall entrepreneurial support environment, outlining the main

start-up hubs as well as start-up trends in Germany and identifying necessary measures for improvement. The fourth chapter describes the methodology used for the present research work. Consequently, the research design, research method, data collection, and applied evaluation process are outlined to ensure transparency as well as the comprehensibility of the present research work. The fifth chapter represents the main research findings. The research outcomes were divided into nine categories to guarantee a clear, comprehensive presentation of the results (accessibility, offered service, equipment, organizational elements, entrepreneurial motivation, uniqueness and critical success factors, start-up trends, characteristics of an incubator at universities and HEIs, and perception of the German start-up ecosystem). The sixth chapter evaluates and discusses the main research findings. A summary of the research study, its limitations, a conclusion, and an outlook suggesting future research studies comprise the final chapter.

2. Theoretical Background

2.1 The Evolutionary View of Innovation

Today, the global economy faces several challenges, including global warming, political crisis, demographic changes, and scarcity of resources. Nevertheless, difficult economic situations also leave space for new opportunities, especially for innovative approaches and solutions (Faltin 2018, pp. 4–5). Nelson and Winter stated in 1982 that *"economic change is important and interesting"* (Nelson and Winter 1982, p. 3). Hence, technological as well as organizational innovations are of vital importance to the economic, social, and political welfare (Edquist 1997, p. 1).

Due to permanent changes and the dynamic nature of economic actions, the traditional theory of economics has been questioned by academics. The most profound evolutionary theory has been introduced by the authors Nelson and Winter, stating that markets possess a certain deficiency, meaning that perfect market information as well as market equilibriums represent a fictitious belief. As a result, the ability to compete and survive in the market is linked not only with profits, which would simply imply that uneconomical businesses are no longer part of the market. Therefore, Nelson and Winter indicate that markets are driven by a natural process of selection that is attributed to the performance and efficiency of a business and to its ability to be decisive (Nelson and Winter 1982, p. 4).

Another difficulty of the neoclassical economic theory is the misunderstanding of skills and knowledge within a company. Differing from the traditional theory, the evolutionary theory implies that technological expertise and internal knowledge are generated dynamically by interplays between internal operations and the outside world. Businesses operate in a highly non-static system where the concept of perfect market information represents a delusion (Golichenko 2016, p. 467).

Furthermore, the assumption of rational behavior during business operations is doubted as well (Dosi and Nelson 1994, p. 154). The authors Nelson and Winter state that an individual's ability to act rationally during complex decision-making

processes is bounded, meaning that rational behavior is limited as human behavior is characterized by bounded rationality (Nelson and Winter 1982, p. 35).

The process of innovation cannot be rationalized (Golichenko 2016, p. 466), which the author Lundvall emphasized by stating: *"In the models of standard economics, innovations appear as extraordinary events, coming from the outside, which temporarily disturb the general equilibrium" (Lundvall 2016, p. 92)*.

In the past, the innovativeness of a firm had been characterized by an uncommon phenomenon that occurs mainly outside of the business environment (Lundvall 2016, p. 93). Today, the innovation capacity as well as the overall innovation dynamic of a business demonstrate a powerful source of competitive advantage (Lundvall 2016; Edquist 1997). Innovation initiates change, as some individuals discover new and enriching possibilities (Tidd, Joseph, 1960- 2013, p. 8).

Joseph A. Schumpeter, an evolutionary economist and the founding father of the theory of innovation economics, stated that innovations emerge due to new possibilities of combining existing components. Individuals who possess the ability to explore such business opportunities are, according to Schumpeter, entrepreneurs. He emphasized the recombination of available resources in an organization as the main source of innovation (Schumpeter 1949, pp. 132–133).

In one of his earlier works, Schumpeter states that the economy is affected by permanent change, which then initiates changes in economic activities. The permanent alteration empowers innovations by making space for new paths while destroying the old ones, which Schumpeter termed "creative destruction" (Schumpeter 1942, pp. 82–83).

For this reason, innovation can be depicted as a transformational process of new economical procedures or, more commonly, as modifications of available components (Nelson and Winter 1982; Edquist 1997). Nevertheless, innovation represents a highly intricate process that implies a mechanism for knowledge transfer and the ability to place it into effect (Edquist 1997, p. 1).

2.2 Innovation System

Given the intricacy of innovation, it can be stated that the process of innovation is not linearly distributed and does not emerge in seclusion. Innovation can be seen as an interconnected system representing the interrelationship between economic sectors as well as public domains (Edquist 1997, pp. 1–2).

As a consequence, academics began to see innovation as a system rather than as an isolated event (Freeman 1987; Nelson 1993; Edquist 1997; Lundvall 1999). The authors Charles Edquist and Christopher Freeman stated that cooperation between businesses and institutions is essential to drive innovation (Freeman 1995; Edquist 1997). Hence, the political, industrial, and educational sectors play crucial roles in the system of innovation by enabling the transfer of knowledge (Edquist 1997, p. 2). Nevertheless, to understand the complexity and the interaction attributes inside a system, it is important to clarify the main properties and characteristics.

A system consists of various components interacting with each other to achieve a common goal. These components comprise market participants, such as operating businesses, educational institutes, or public authorities. Nevertheless, the components of a system also comprise tangible as well as non-physical artefacts and institutional as well as societal framework conditions. The interaction among these components stands in relationship to one another, meaning that at least one component interoperates with another component, and they rely on each other. Moreover, activities involving one or more components influence or alter the entire system. The correlation between the components enables a feedback mechanism, which in turn empowers the system by being more dynamic. The features among the components as well as their relationships with each other represent the main characteristics of a system that are affiliated with the primary objective of the system (Carlsson et al. 2002, p. 234). Therefore, to identify the main features and to fully comprehend such systems, it is important to understand the main purpose of the system (Klein and Sauer 2016, p. 5).

In summary, a system works toward a common objective, which can be derived by the main attributes of a system that simultaneously represent the primary abilities of the participants (Carlsson et al. 2002, p. 235).

Feedback, knowledge, and a mechanism for technology transfer are the driving forces of innovation systems. Acquiring and transferring technological knowledge especially demonstrates one of the main functions of an innovation system. Unintentional technology transfer mechanisms represent spillover effects. Nevertheless, a system also comprises the intended mechanism between a vendor and its recipients (Carlsson et al. 2002, p. 234).

Various forms of innovation systems comprising regional, sectorial, technological, and national characteristics are fundaments of academic studies of innovation systems (Carlsson et al. 2002, p. 233).

For the purpose of this paper, the next chapter outlines the concept and main components of a national innovation system to emphasize the importance of the educational sector to innovation.

2.3 The National Innovation System

The late 1980s represents the starting point of the national innovation system (NIS) approach. This concept first attracted attention through European political discourse about industry policies, and thereafter, many scholars published studies examining the importance of a national innovation system (Sharif 2006, p. 745).

Academics began to analyze competitiveness in relation to the innovation potential of nations. Because of the NIS approach, the innovation capabilities of various nations can be compared easily. Moreover, the NIS concept has the ability to expose the sources of innovation, the main drivers as well as the primary obstacles (Klein and Sauer 2016, p. 2).

One of the greatest academic contributions to the NIS concept was provided in 1987 by Christopher Freeman, who is seen as its founding father (Freeman 1987),

followed by the authors Nelson (Nelson 1993), Lundvall (Lundvall 1992) and Edquist (Edquist 1997). Ever since, the concept of NIS has become a foundation for policy-makers, institutional leaders, governmental authorities, and global organizations, for example, the Organization for Economic Cooperation and Development (OECD) (Edquist 2006; Sharif 2006).

From a theoretical point of view, an open system, such as the NIS concept, enables a transfer of knowledge between different components and participants that in turn disrupts the equilibrium theory, representing a paradigm shift away from the traditional market equilibrium (Edquist 1997, p. 182). Because of ever-growing global interdependence, the concept of NIS has become an increasingly open system (Edquist 1997, p. 345).

The authors Balzat and Hanusch define NIS as follows:

> *"A national innovation system can be perceived as a historically grown subsystem of the national economy in which various organizations and institutions interact with and influence one another in the carrying out of innovative activity." (Balzat and Hanusch 2004, pp. 197–198)*

Such systems, as stated by Edquist, comprise

> *"[...] all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations." (Edquist 1997, p. 14)*

In the field of research, the NIS framework provided by the authors Kuhlmann and Arnold (Figure 1) represents one of the primary models that have been applied and expanded upon by researchers. The industrial system as well as the education and research sector represent the core areas of the NIS, which are connected through intermediaries. Both core areas are affected by economic, societal, and infrastructural factors formed around political conditions (Warnke et al. 2016, p. 3).

Prior to the NIS, the main focus was placed on the ability of the industrial sector to collaborate with other business activities. Consequently, the NIS framework

illustrates the expanded systematical division concerning the main actors and components on a national level (Carlsson et al. 2002, p. 236).

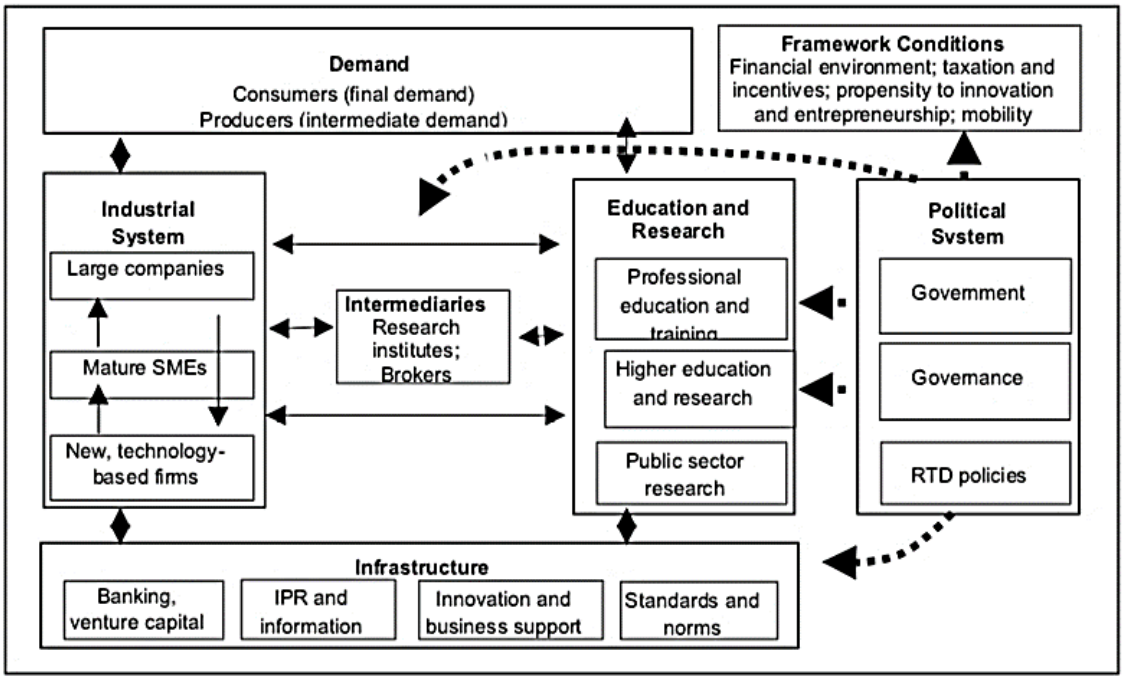

Figure 1. National Innovation System Framework
(Source: Kuhlmann and Arnold 2001, p. 2)

The distribution and exchange of new technologies, especially technical applications and new tools represent one of the primary transfer mechanisms within a system. The adjustment process of such technologies changes from business to business corresponding to national framework conditions and business performance capabilities. Nevertheless, due to a vast amount of newly developed technologies, the innovativeness of companies mainly depends on the pace of implementation of emerging technologies that are developed mainly outside the company (OECD 1997, p. 15). HEIs, research and development institutions, and universities began to establish specific centers for the development of new and innovative technologies. The emergence of such centers generated spillover effects as companies acquired knowledge and gained access to technological networks (OECD 1997, p. 14).

As a result, innovation centers began to operate as innovation intermediaries. Consequently, businesses' research and development (R&D) operations are being reinforced due to innovative research findings (Clark 2014, p. 10).

The NIS framework provided by Kuhlmann and Arnold (Figure 1) represents two main intermediaries, namely, research institutions and brokers (Kuhlmann and Arnold 2001, p. 2). Nevertheless, the authors Warnke et al. suggest involving more participants who function as innovation intermediaries, because of the rising intricacy of innovation systems and the growing interconnectedness of innovation processes (Warnke et al. 2016, pp. 17–18).

Due to increasing internationalization (Freeman 1995, p. 15); the ubiquitous presence of the internet, with its ever growing field of applications and access to open-source software (Chris Anderson 2012, p. 7); and the resulting interconnectivity of individuals in online communities (Kostakis et al. 2014, p. 555); new participants began to engage in the NIS, indirectly influencing the system of innovation (Warnke et al. 2016, p. 21).

As a result, new concepts have emerged over the past few decades, driving economic innovation and empowering entrepreneurial mindsets. One example is the concept of incubation in conjunction with the emerging role of academic spin-offs (Bergek and Norrman 2008, p. 20).

Moreover, revolutionary movements, such as the maker movement, and the emergence of several community-based creative spaces, for instance, makerspaces, fab labs, and hackerspaces further stimulate innovation regionally and nationally. Therefore, in the following a detailed explanation of the incubation concept as well as the maker movement and the resulting makerspaces, fab labs, and hackerspaces will be provided.

2.4 Definitions and Terminology

2.4.1 The Concept of Incubation

Over the past several years, the concept of incubation has become an important topic for researchers and academics. With the continuously rising interest in entrepreneurial activities, incubators make an essential contribution to this trend. Incubators enable the transfer of technology and knowledge, support and assist the creation of new businesses, and contribute to the overall development and economic growth of countries (Grimaldi and Grandi 2005, p. 112).

Entrepreneurs who aim to establish a new company include incubatees who receive assistance from incubators to positively reinforce all business start-up phases (Seno Wulung et al. 2018, p. 2309). After the final phase of the incubation process, start-ups can develop into self-containing and self-sufficient firms (Grimaldi and Grandi 2005, p. 112).

Definitions

Even though the concept of incubation is gaining increasing importance academically as well as publicly, past and current literature demonstrates the variability of definitions and a discrepancy regarding the characteristics and the distinction among different typologies (Mian 1994; Bone et al. 2017; Dee et al. 2015; Grimaldi and Grandi 2005; Hackett and Dilts 2004).

For instance, the authors Hackett and Dilts define business incubators as follows:

> *"A business incubator is a shared office-space facility that seeks to provide its incubatees (i.e. 'portfolio-' or 'client-' or 'tenant-companies') with a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance." (Hackett and Dilts 2004, p. 57)*

The authors Grimaldi and Grandi defined the concept of incubation by stating:

> *"The incubation concept seeks an effective means to link technology, capital and know-how in order to leverage entrepreneurial talent, accelerate the development of new companies, and thus speed the exploitation of technology." (Grimaldi and Grandi 2005, p. 111)*

The project "Incubating Success: Incubation Best Practices That Lead to Successful New Ventures", financed by the U.S. Department of Commerce Economic Development Administration and assisted by the National Business Incubation Association, defined incubation programs as follows:

> *"Business incubation programs are designed to accelerate the successful development of entrepreneurial companies through an array of business support resources and services, developed or orchestrated by incubator management, and offered both in the incubator and through its network of contacts." (Lewis et al. 2011, p. 15)*

Although there is no distinct and uniform definition of the incubation concept, program, or a business incubator itself, the main objective is indisputable, to encourage and assist entrepreneurs by establishing a new business idea. At the end of a successful process, the business ideas have been developed into sustainable and successful companies that are independent and self-reliant (Grimaldi and Grandi 2005; Bergek and Norrman 2008; Hackett and Dilts 2004; Mian 1996; Lewis et al. 2011).

The incubation concept emerged during the late 1970s and received further attention in the 1980s, mainly in the United States, with the objective of commercializing academic research projects. Most of the incubators located themselves close to HEIs or universities. The initial concept of incubators was to provide start-up businesses with required resources as well as facilities to stimulate business success. Nevertheless, the main objective of the incubator concept depends on an individual's main interest, for instance, profit-seeking or striving for nonprofit objectives and content-based orientation (Stahlecker and Lo 2004, pp. 1–2).

Therefore, the authors Bergek and Norrman placed emphasis on the diversification and disparity of various incubation approaches. The empirical study demonstrated that it is essential to create a concept of the objectives for the incubator, which is not necessarily the same for other incubation approaches (Bergek and Norrman 2008, p. 26). For example, the authors Grimaldi and Grandi divided business incubators into four divisions, namely university business incubators, independent private incubators, business innovation centers and corporate private incubator (Grimaldi and Grandi 2005, p. 111).

Public Business Incubators

The best-known form of public business incubators is the concept of business innovation centers, initially established in 1984 in Europe. Business innovation centers provide services such as office facilities and communication tools and offer details about debt financing options. This concept is mostly publicly funded or financed through service charges as well as rental charges. The principle aim behind the establishment of public incubators such as business innovation centers is the reduction in expenses for tenant companies through the offer of experience, knowledge, management assistance, and working space as well as the provision of a communication network (Grimaldi and Grandi 2005, p. 112).

University business incubators are a different type of public business incubators (Grimaldi and Grandi 2005, p. 112). This concept was established to link universities and HEIs with entrepreneurial activities to enhance regional development (Mian 1994, p. 515). University business incubators are comparable to business innovation centers. Nevertheless, university business incubators concentrate more on mechanisms to transfer technology and academic knowledge to the external business environment (Grimaldi and Grandi 2005, p. 112). University incubators typically offer office facilities and workspaces, assistance services, corporate networks, and services associated with universities, such as laboratories, required equipment, or libraries (Mian 1996, p. 330).

The research paper of Nesta, a British innovation foundation established for the Department of Business, Energy, and Industrial Strategy, defines these forms of incubation according to the following attributes (Bone et al. 2017, p. 12):

- No certain span of time; the ending of the incubation phase depends on the development stage of the company instead of a concrete period of time;
- Generally dependent on tenant fees and charged services;
- Mainly concentrates on facilities, for instance, workspace instead of assistance services;
- Ad-hoc based authorization;
- Offering assistance service in the form of guidance, business management support and training within the field of entrepreneurship;
- Commonly offering technical equipment and working space, for instance, laboratories; and
- Admission depending on a rather small selection process

Private Business Incubators

Independent private incubators and corporate private incubators are forms of private incubators. They emerged as a result of changing market conditions, the increasing significance of high-technology enterprises, and especially due to economic changes. From a financial point of view, private incubators earn money by charging for assistance services. Moreover, incubators receive a share of the revenue from the incubated firms. The main objective is to allocate financial resources during the early stages of a business, which typically had been provided by venture capitalists and so-called business angels. The creation of a sustainable business model as well as helping and supporting the entrepreneurs by providing expert knowledge offered within the business network are the main objectives of private business incubators (Grimaldi and Grandi 2005, p. 113).

The authors describe corporate private incubator as a form of incubation established inside a company. During this process, a new business division is created, resulting

mainly from research activities. Due to capital participation and equity investments, the start-up is primarily governed by the organization. Comparable to university business incubators, corporate private incubators mostly support new ventures during the first phase of the development process. Contrary to the corporate form of business incubation, independent private incubators represent single persons as well as a group of persons who support and encourage new business ideas to ensure a successful business development. These incubators financially support the entrepreneurs with their private equity. As a result of their equity participation, the incubators hold a stake in the company's equity. This form of business incubation is also known as an accelerator, as the incubators typically become involved after the establishment of a business model by offering expertise and financial resources (Grimaldi and Grandi 2005, p. 113). Therefore, independent private incubators or accelerators offer assistance to fast-growing enterprises to enhance and further stimulate their business success (Bone et al. 2017, p. 13).

As regards the comparison between private and public incubators, the following attributes of accelerators are proposed by the British innovation foundation Nesta (Bone et al. 2017, p. 13):

- Pre-determined length of incubation program, mostly three to 12 months;
- Growth-oriented business model, contribution due to equity capital;
- Allocation of liquidity, providing initial capital;
- Concentration on the provision of service rather than working space and facilities;
- Cohort-based authorization; and
- Admission depending on a rather larger selection process

In conclusion, the new economic era of business incubation emerged mainly as a result of rising interest in entrepreneurial activities, primary in response to digital development (Grimaldi and Grandi 2005, p. 113). These incubation concepts have demonstrated success in enhancing the course of business and in increasing the survival rate of newly established enterprises (OECD 1999, p. 10).

Business incubation represents one form of support service established for new ventures. However, other new approaches have been established to support entrepreneurial activities, for instance, makerspaces (Bone et al. 2017, p. 14). Therefore, the next chapter concentrates on the revolutionary maker movement and introduces the development of various workspaces.

2.4.2 The Maker Movement Revolution

In his book, “Makers: The New Industrial Revolution”, the author Chris Anderson states that the maker movement represents the third industrial revolution by combining digital and individual production processes (Chris Anderson 2012, p. 41). The new era of makers is driven by the digital revolution and the resulting information transfer, tools, and developed technologies that enable access to all required resources (Wolf-Powers et al. 2017, p. 366). The author Chris Anderson emphasized *“the beauty of the web”* (Chris Anderson 2012, p. 7), as it enables individuals to create new business ideas with open-source software, which generally does not require expert knowledge (Chris Anderson 2012, p. 7).

Moreover, the digital revolution enables individuals to share their ideas, knowledge and interests with an online community, which in turn inspires others and thereby enables new business opportunities and successful cooperation (Kwon and Lee 2017; Chris Anderson 2012). Nevertheless, the development of new technologies and the digital era are only two aspects that influence the maker culture. The new revolution seeks physical and real outcomes rather than digital transformations (Dale Dougherty 2012; Chris Anderson 2012). For this reason, makers represent a more sophisticated form of the do-it-yourself (DIY) culture, combining personal manufacturing with digital assets (van Holm 2015a; Kwon and Lee 2017; Chris Anderson 2012).

Traditional DIYers have made their mark in the past as hobbyists or tinkerers. These new, revolutionary DIYers are inspired and enabled by their access to production technology and digital design tools (Troxler 2016, p. 111).

The maker movement grew out of several sources, including Make magazine, founded by Dale Dougherty in 2005 and published by O'Reilly Media; the emergence of the Maker Fair and the launch in 2007 of RepRap, at which the first non-proprietary 3D printer software was demonstrated; and MakerBot, which represents one of the first 3D printers (Chris Anderson 2012; Hepp 2018).

Current academic literature defines makers as individuals who belong to a revolutionary new form of manufacturing (Hepp 2018, p. 3). The literature also emphasizes the fact that any individuals can define themselves as makers (Chris Anderson 2012; Dale Dougherty 2012; van Holm 2015b), for example, a passionate chef can be seen as a *"kitchen maker"* (Chris Anderson 2012, p. 13).

The author Dale Dougherty states:

> *"When I talk about the maker movement, I make an effort to stay away from the word 'inventor'—most people just don't identify themselves that way. 'Maker,' on the other hand, describes each one of us, no matter how we live our lives or what our goals might be." (Dale Dougherty 2012, p. 11)*

The authors Kwon and Lee state that the difference between the DIY movement and traditional inventors compared to the modern maker culture is the impressive influence and resulting impact of technological advancements (Kwon and Lee 2017, p. 319) in connection with economic globalization (Hagel et al. 2013, p. 3). The modern maker culture enables individuals to develop new business ideas, goods, and services while shortening the learning process due to online networks and communities (Kwon and Lee 2017, p. 319).

Consequently, it can be stated that "making" describes any activity that is performed by oneself to create and design new goods and services while using new technologies (Schön and Ebner 2017, p. 2).

In his book, "Makers: The New Industrial Revolution", Chris Anderson introduces three attributes that he believes are at the foundation of the maker movement (Chris Anderson 2012, p. 21):

- Online software and digital tools are used to develop new goods and to create mock-up models in type of *"digital DIY"* (Chris Anderson 2012, p. 21);
- Ideas and prototypes are shared on digital platforms, thereby creating cooperation; and
- Standardized digital design data sets that are technically feasible and easily constructed by business production services are used. This standardization drastically shortens the idea-generation process to create active entrepreneurialism

A variety of facilities characterized by different organizational structures, supplied equipment, or specified field have been emerged as a result of the revolutionary maker movement. In many cities, these facilities, namely, makerspaces, fab labs, or hackerspaces provide creative spaces to support entrepreneurial activities and to foster innovation (Schmidt et al. 2016, p. 12). The following chapter defines and introduces the main characteristics of these facilities.

2.4.3 Makerspaces

Makerspaces, fab labs, or hackerspaces represent an essential element of the fast growth of the maker movement (van Holm 2015a, p. 25). These facilities have gained enormous attention from the general public, governmental bodies, and the media, especially for empowering entrepreneurial activities (van Holm 2017, p. 164). Moreover, they drive economic development as well as the potential for regional innovation and represent an interconnected network of individuals who enable the transfer of information and knowledge (Bergner 2017, p. 77). A vast number of makerspaces have been established around the globe, with considerable potential for further growth (Chris Anderson 2012, p. 18).

The study of van Holm examined the economic development potential of makerspaces in Georgia in the United States and found that makerspaces are being established mostly to enable regional growth and economic development (van Holm

2017, p. 167). This is done by strengthening regional entrepreneurialism, supporting new business ideas, and growing business retention rates (van Holm 2017, p. 168).

Makerspaces allow workshops for new opportunities, encourage and motivate creative individuals, and thrive on community involvement (Bergner 2017, p. 33). While, makerspaces provide individuals with a remarkable stock of tools and specific software, the creative atmosphere also results in the efficient use of resources (van Holm 2017, p. 165).

Because these terms are becoming increasingly important in today's creative economy, researchers and academics are working to analyze and define them, but there is no clear consensus yet (van Holm 2015b, p. 1). For example, the authors Schön and Ebner define makerspaces as facilities or workshops where makers create new goods by using new technologies and tools (Schön and Ebner 2017, p. 3), provided against a fee (van Holm 2015a, p. 25).

In comparison, the author van Holm defines makerspaces as follows:

> *"Makerspaces are also commonly known as hackerspaces and fab labs, and are generally understood to be community workshops where members share tools for professional gain or hobbyist pursuits. These spaces attract individuals who identify as makers and support members by spreading the cost of industrial tools and gathering community to share knowledge, time, and effort on projects." (van Holm 2015b, p. 2)*

The study "Make-Design-Innovate" at the University of Coburg, financed by the Bavarian State Ministry for Economics and Media, Energy, and Technology, defined makerspaces as openly accessible workshops that offer cost-effective, high-technology tools and digital software for any individual to initiate research and development, creativity, crafting, and independent experiments (Bergner 2017, p. 25).

This implies that makerspaces do not have a specific admission procedure (Bone et al. 2017, p. 15), which constitutes a considerable difference between makerspaces and private or public business incubators. Moreover, some makerspaces charge a

reasonable membership fee (van Holm 2017, p. 165) but do not offer advisory or business performance support services such as those available through the business incubation process (Bone et al. 2017, p. 15). Nevertheless, some makerspaces offer trainings and seminars to facilitate efficient utilization of available tools (van Holm 2015a, p. 25).

This membership-based concept enables knowledge as well as information transfer between individuals through shared experiences and competencies (van Holm 2017, p. 165). Therefore, the biggest differences between makerspaces and the incubation concept are the supply of instruments and the admission process (van Holm 2017, p. 169).

To summarize, makerspaces offer a wide range of tools and new technologies to facilitate various types of manufacturing techniques. Moreover, makerspaces foster knowledge transfer between individuals by creating local communities. As a result, makerspaces provide cooperative, community-based, resourceful, and creative workshops that allow for the exchange of technology, innovation, and knowledge among entrepreneurs (Zinke et al. 2018, p. 89).

2.4.4 Fab Labs

Just as Dale Dougherty shaped the maker movement with the launch of Make magazine in 2005 and the first Maker Fair in 2006 (Dale Dougherty 2012, p. 11), Neil Gershenfeld established the first fabrication lab (Fab Lab) in 2003, with support from the U.S. National Science Foundation (Gershenfeld 2012, p. 47).

The Center for Bits and Atoms in Massachusetts, which is led by Gershenfeld, was established to examine the division between digital and physical science. The success of the course *“How to Make (almost) Anything”* (Gershenfeld 2012, p. 46) at the Massachusetts Institute of Technology served as an inspiration for the development of the first fab lab, which provides on-site tools and machinery instead of simple instruction about the associated implementation process. The center’s new technology includes 3D printers, computerized lasers, and other resources that are

managed through custom-made software. Therefore, the success of the first fab lab can be seen as an inspiration for the global fab lab community (Gershenfeld 2012, p. 48).

The author Troxler defined fab labs as follows:

> *"Fab labs share the concepts of providing infrastructure for manufacturing to the general public, of stimulating innovation and of business creation with other, similar workshops like makerspaces and the Techshop chain. The network approach of fab labs and the requirement to share designs and processes set them apart." (Troxler 2016, p. 111)*

As Troxler states, fab labs and makerspaces share a common principle and often offer the same devices and machines. Nevertheless, what sets fab labs apart is the global network they provide. Moreover, some institutions see the term "fab lab" as a threat to their business plans, as fab labs are commonly known to be accessible to anyone without a fee (Troxler 2016, p. 113).

Fab labs are the first facilities to make 3D printers publicly available. Nevertheless, these sophisticated printers are only one of many technologies that are offered for fabrication purposes. Fab labs are mostly housed at HEIs or schools or have been funded by large corporations. A characterizing element is the model of a common-based peer production by providing a distribution network (Troxler 2016, p. 110).

Even though an enormous spectrum of fab labs exist, the common factor among all facilities is a sharing platform enabling information and knowledge transfer (Gershenfeld 2012, p. 48). For instance, the fab lab in Boston demonstrated the advantages of being part of a global network. By sharing expert knowledge globally, projects had been completed that, without the support of other fab labs, could not been produced locally. Gershenfeld stated that the ability to share data worldwide enables local production, which in turn revolutionizes the industry (Gershenfeld 2012, p. 48). This indicates a shift toward a more personalized manufacturing operation, as individuals take part in both the design and manufacturing processes (Mortara and Parisot 2016, p. 7158).

There are no common approaches to developing a fab lab; nevertheless, the procedure is being studied at the Massachusetts Institute of Technology, which also maintains a global fab lab directory (Troxler 2010, p. 3). Fab labs act according to fundamental principles provided by the Fab Charter, which contains general guidelines (Troxler 2010, pp. 4–5). Moreover, fab labs around the world have created regional communities; for instance, the American Fab Lab Network and the FabLab.nl in Holland, Luxembourg, and Belgium support and help smaller fab labs with projects that are too comprehensive for those single facilities. These regional organizations are joined together in the global Fab Foundation, which supports fab labs by enabling global resource allocation (Gershenfeld 2012, p. 56).

Additionally, the Fab Academy simplifies the process of sharing knowledge and information across all fab labs. This is an especially significant advantage for fab labs situated in remote locations. Individuals share knowledge and information through online conferences or trainings, and the Fab Academy handles the global administration, thereby mobilizing local production (Gershenfeld 2012, p. 56). Gershenfeld states that, in the end, the greatest advantage lies within the social cohesion and community network provided by fab labs rather than merely the technical machines (Gershenfeld 2012, p. 57).

Fab labs do not possess a common operational structure, and the allocation of financial resources also differs. Some fab labs are established as self-sufficient and autonomous institutions and others are supported by universities and HEIs. Financial resources are mostly publicly funded provided that the fab lab become self-sufficient after several years of operation (Hielscher and Smith 2014, p. 11).

2.4.5 Hackerspaces

Makerspaces and fab labs are among the many facilities enabling and empowering entrepreneurialism. Another hub of creativity shaped by the maker movement is a hackerspace (Troxler 2016, p. 113).

The author Troxler defined hackerspaces as follows:

> *"Hackerspaces are workshops for people with an interest in technology to socialize, collaborate and share knowledge. Their focus is more on technology in general but 3D printing and making often plays an important role." (Troxler 2016, p. 113)*

Hackerspaces are known for their information technology (IT) specifications, focusing mainly on data processing and electronic engineering (van Holm 2015b, p. 3). The name "hackerspace" has its roots in hacking, describing the procedure of disassembling something to gain an overview of its features and essential parts. The term hackerspaces is associated with computer scientists, who dominate the computer language (van Holm 2015b, p. 4). Nevertheless, hacking also features a non-virtualized environment (Moilanen 2012, p. 94).

Hence, the authors Kostakis, Niaros and Giotitsas defined hackerspaces by stating:

> *"[...] the term 'hackerspaces' refers to the physical, community-led places where individuals, immersed in a hacker ethic, are to be met with on a regular basis engaging with meaningful, creative projects." (Kostakis et al. 2014, p. 557)*

Starting virtually, the hacker community began to create physical hackerspaces where individuals can come together to transfer knowledge and information (Kostakis et al. 2014, p. 557), comparable to makerspaces and fab labs. This expands the online community to real-world communities that share expertise and experiences together in physical spaces (Kostakis et al. 2014, p. 557). The first hackerspaces were established in the 1970s and included the Homebrew Computer Club during the 1970s (van Holm 2017; Kostakis et al. 2014).

To summarize, hackerspaces are mainly for individuals who dominate the programming language. The development of open-source software illustrates one of the main objectives of hackerspaces. Nevertheless, digital tools and hardware designs are also part of the hacker world (Schön and Ebner 2017, p. 3).

2.4.6 Different Support Measures

Besides makerspaces, fab labs, and hackerspaces, there are other ways to support an entrepreneurial environment and thereby foster innovation. This chapter briefly introduces two other forms of support for entrepreneurialism that have emerged in recent years.

Accelerator

As mentioned in subchapter 2.4.1, the accelerator concept focuses on already existing start-ups with a defined business model. The accelerator's primary goal is to improve the business model to enhance the operational performance of the respective start-up. Moreover, accelerators aim to enable interactions between the start-ups and their relevant industry to facilitate financial resources to enhance growth and competitiveness. Accelerator programs offer camps, trainings, and assistance; additionally, accelerators participate in public events such as pitch presentations. This offers start-ups the opportunity to directly present their business model to potential customers and to build an industry network (Zinke et al. 2018, p. 69).

One of the main characteristics of accelerator programs is an extensive and highly competitive selection process. Start-ups work together in groups for a limited period of time. Accelerator programs are mainly financed through equity shares from the respective start-ups. Therefore, an accelerator's main purpose is to generate and drive business growth opportunities. As stated above, the traditional accelerator program focuses on start-ups with a defined business model. Nevertheless, pre-accelerator concepts have emerged to support start-ups in their early phase, giving the start-up the opportunity to join an accelerator program afterwards (Bone et al. 2017, p. 13).

Coworking Spaces

A coworking space can be a leasable office space for start-ups, entrepreneurs, and freelancers. Compared to classical office spaces, coworking spaces represent a low-cost alternative that offer single workstations, internet access, office supplies and conference rooms. Coworking spaces are characterized by their open environment and the opportunity to collaborate and network with individuals from various disciplines. As a result, a coworking space can initiate collaborations between start-ups and entrepreneurs as well as facilitate peer learning (Zinke et al. 2018, p. 78).

In general, coworking spaces do not offer support services and therefore represent only a community workspace. Nevertheless, some coworking spaces have begun offering additional support. To summarize, a coworking space represents an open workspace that is accessible to start-ups and entrepreneurs who pay rent through a contractual relationship without any time restrictions (Bone et al. 2017, pp. 14–15).

3. Start-up Environment in Germany

This chapter provides an overview of the entrepreneurial support environment in Germany, examining entrepreneurial activities and the overall motivation behind this type of business development. Moreover, the main start-up hubs in Germany as well as development trends are presented. Suggestions for improvement are also provided by analyzing several studies of the start-up ecosystem in Germany.

The most relevant study for this chapter is that of the German Start-up Monitor 2019, which analyzed 1,933 start-ups across Germany (Kollmann et al. 2019, p. 12). The 2017 and 2018 reports of the German Start-up Monitor serve as a basis of comparison to obtain a better overview of the German start-up ecosystem in recent years (Kollmann et al. 2017; Kollmann et al. 2018).

Other relevant studies include (1) the Global Entrepreneurship Monitor (GEM) 2018/2019, which analyzed 49 economic systems and provided an international picture of various start-up ecosystems (Bosma and Kelley 2019, p. 11); (2) a 2018 study conducted by the institution for innovation and technology, sponsored by the German Federal Ministry for Economic Affairs and Energy (BMWi), which analyzed support programs as well as facilities that provide supportive measures for start-ups throughout Germany (Zinke et al. 2018, p. 16); and (3) a study by the Leibniz Centre for European Economic Research (ZEW), namely, the IAB/ZEW Gründungspanel, which examined the German federal state of Baden-Wuerttemberg. The report provided by the ZEW comprises entrepreneurial as well as innovation activities, financial structures, and supportive measures and examines sustainable entrepreneurial success (Gottschalk and Lubczyk 2019, p. 1).

3.1 The Entrepreneurial Support Environment in Germany

Start-ups need supportive measures to ensure that they are successful in implementing their desired strategies. Early-stage start-ups require mainly financial resources, industrial relations, and assistance to guarantee successful business

operations. Start-ups that have already developed their business model seek to expand their market coverage and need support to extend and strengthen their business model. Due to the ever-rising interest in entrepreneurialism and the continuous growth of the German start-up ecosystem, a wide variety of support programs have been established. The 2018 study by the institution of innovation and technology identified 1,130 support programs as well as facilities that provide supportive measures for start-ups. Start-ups' diverse needs and requirements have led to a variety of support programs and facilities that distinguish themselves by market segments and provide the necessary technologies. Nevertheless, the study by the institution of innovation and technology also revealed that the differentiating features of these services have become indistinct (Zinke et al. 2018, p. 16).

This was the result of the emergence of an increasingly dynamic start-up ecosystem in Germany. However, the great variety of offers and their lack of distinctiveness challenges start-ups to identify the best fit and to make the appropriate choice for their business needs. As a consequence, start-ups and entrepreneurs face a daunting task while seeking necessary support (Zinke et al. 2018, p. 156).

Start-ups in Germany characterize private suppliers as being more professionally experienced and therefore offering efficient partnerships. Therefore, start-ups perceive the provision of service, the proximity to their companies, and the large network of business partners as favorable for their personal business operations. Although the study by the institution of innovation and technology demonstrated a tendency toward more professional services, the selection process of start-ups today depends prominently on trade-off agreements. The study revealed that start-ups possessing significant growth potential are less willing to surrender any equity or independence (Zinke et al. 2018, p. 159).

For this reason, the study by the institution of innovation and technology emphasized the trend toward public programs in Germany, as universities and HEIs provide more specialized programs than private providers. Moreover, publicly offered programs or facilities generally do not charge fees or, compared to private institutions, acquire a

proportional share of equity. Most importantly, public partnerships provide the start-ups more independence (Zinke et al. 2018, p. 157).

Universities and especially HEIs offer a wide range of support services, including incubator programs and similar facilities. Service include in-house space for entrepreneurial activities, separate facilities in the form of incubation and innovation centers, and cooperation with already-existing technology and research centers. The facilities and support programs at HEIs and universities are mainly of a non-commercial nature (Stahlecker and Lo 2004, pp. 1–3).

The study by the institution of innovation and technology also emphasized the nonprofit objective of universities and HEIs regarding entrepreneurial activities. As a result, such facilities and programs do not prioritize fast profit-earning capacity (Zinke et al. 2018, p. 157). The objective behind the establishment of entrepreneurial facilities at universities or HEIs is mainly to generate university spin-offs, enabling the creation of new business ideas as well as the discovery of new technological advances that otherwise would have been untapped (Stahlecker and Lo 2004, p. 4). Moreover, these facilities and programs aim to reinforce and empower local entrepreneurial activities, to remedy the shortage of available private offers, and to ensure a stable economic and social environment (Zinke et al. 2018, p. 157).

The 2019 study by the German Start-up Monitor analyzed 1,933 start-ups comprising 4,707 entrepreneurs and 24,050 employees in Germany (Kollmann et al. 2019, p. 6). Throughout the study, respondents favorably mentioned local start-up networks. Moreover, 82.1% of the respondents positively value the proximity to HEIs or universities and 54.6% of the respondents cooperate with those academic institutions (Kollmann et al. 2019, pp. 63–64). Nevertheless, in 2018, the German Start-up Monitor reported that the respondents insufficiently valued HEIs and universities in terms of entrepreneurial education. Entrepreneurs desire continual improvement of the educational system regarding entrepreneurialism to enhance the start-up culture as well as entrepreneurial motivation on campus. As a result, respondents expect an empowerment of entrepreneurial mindsets and a resulting increase in new business formation (Kollmann et al. 2018, p. 91).

To establish and enhance the entrepreneurial culture and to provide supportive measures for students on campus, the EXIST funding program of the German Federal Ministry for Economic Affairs and Energy (BMWi) plays a decisive role (Stahlecker and Lo 2004, p. 4). The main principle behind this supportive measure is the extension of its educational functions, meaning that, besides education and research, a third function must be implemented, namely, a mechanism to transfer knowledge and technology. For this reason, EXIST aims to introduce an entrepreneurial culture directly on campus to encourage students to become entrepreneurs. Moreover, the program focuses on the commercialization process and aims to strengthen the economic growth potential of research activities and resulting university spin-offs. The EXIST program is based on three building blocks. The first component, the EXIST Culture of Entrepreneurship, aims to enhance the entrepreneurial ambience and to reinforce the overall start-up culture on campus through implementation of new and solid strategies. The second component, the EXIST Business Start-up Grants, encourages and financially assists students and researchers as they work to establish new business ideas. The last component is the EXIST Transfer of Research, which supports start-ups financially as they verify the practicability of new business ideas and their commercialization processes (Dr. Marianne Kulicke 2014, pp. 1–2).

To further strengthen entrepreneurial programs at universities and HEIs, the BMWi established another building block, namely, EXIST Potential. The key objective is to further enhance already-existing start-up cultures as well as networks on campus. Moreover, the concept aims to provide smaller universities and HEIs, which are not yet part of the EXIST community, the opportunity to benefit from the EXIST support program. Therefore, the program comprises best-practice approaches that function as role-model examples for HEIs and universities to strategically establish an entrepreneurial culture on campus. Moreover, the EXIST Potential concept aims to reinforce the regional network by stimulating new collaborations linking HEIs and universities with companies, nonacademic institutions, and investors. Lastly, with EXIST Potential, the BMWi aims to stimulate the internationalization process of the German start-up ecosystem, offering support to start-ups and entrepreneurs as they

expand their international market structures to successfully position Germany as a global entrepreneurial leader (Bundesministerium für Wirtschaft und Energie 2019, p. 10).

Start-up activities and the overall entrepreneurial motivation at HEIs and universities in Germany have increased tremendously as a result of EXIST support programs. Additionally, HEIs and universities have strengthened their reputations as entrepreneurial institutions. Moreover, the building blocks of the EXIST program increase the overall regional development potential by providing new and innovative business formations (Bundesministerium für Wirtschaft und Energie 2019, p. 10).

To summarize, 58.4% of all respondents in the 2019 German Start-up Monitor favorably mentioned their regional start-up ecosystem. Most importantly, 82.1% of all respondents positively valued their proximity to HEIs and universities and 67.1% valued the regional network linking start-ups and entrepreneurs. However, financial resources as well as the provision of professional services and equipment were negatively perceived by the respondents. From a regional viewpoint, Berlin was perceived as offering one of the best start-up ecosystems in Germany (Kollmann et al. 2019, p. 63).

An international study, the Global Entrepreneurship Monitor (GEM) 2018/2019, analyzed 49 economic systems around the globe. In addition to the entrepreneurial motivation and performance of each country, the study also analyzed external factors affecting the start-up ecosystem, for instance, economic stability and social welfare. The GEM study also included the National Entrepreneurship Context Index (NECI), evaluating 54 economic systems against environmental-based parameters that directly affect entrepreneurialism (Bosma and Kelley 2019, pp. 11–13).

As the German Start-up Monitor did in 2019, the GEM study also affirms a rising awareness of entrepreneurship and entrepreneurial activities throughout Germany. German governmental authorities especially recognized the advantageous impacts of new and innovative businesses, particularly concerning regional development opportunities. Nevertheless, compared to other countries, Germany still lags behind (Bosma and Kelley 2019, p. 79).

Figure 2 represents the average of all GEM economical parameters compared to Germany. It becomes conspicuous that German governmental support of entrepreneurialism is above average. Nevertheless, just as the 2019 German Start-up Monitor revealed, Figure 2 also demonstrates the underperformance of the educational system with regard to entrepreneurialism. The Global Entrepreneurship Monitor states that even though overall entrepreneurial awareness and state support measures are high, the overall start-up activity is comparably modest in Germany. This is due to the significant role that working conditions and labor relations play in German industry and the country's overall economy. For this reason, prospective entrepreneurs mostly settle for safe working and payment conditions and prefer contractual employment relationships (Bosma and Kelley 2019, p. 79).

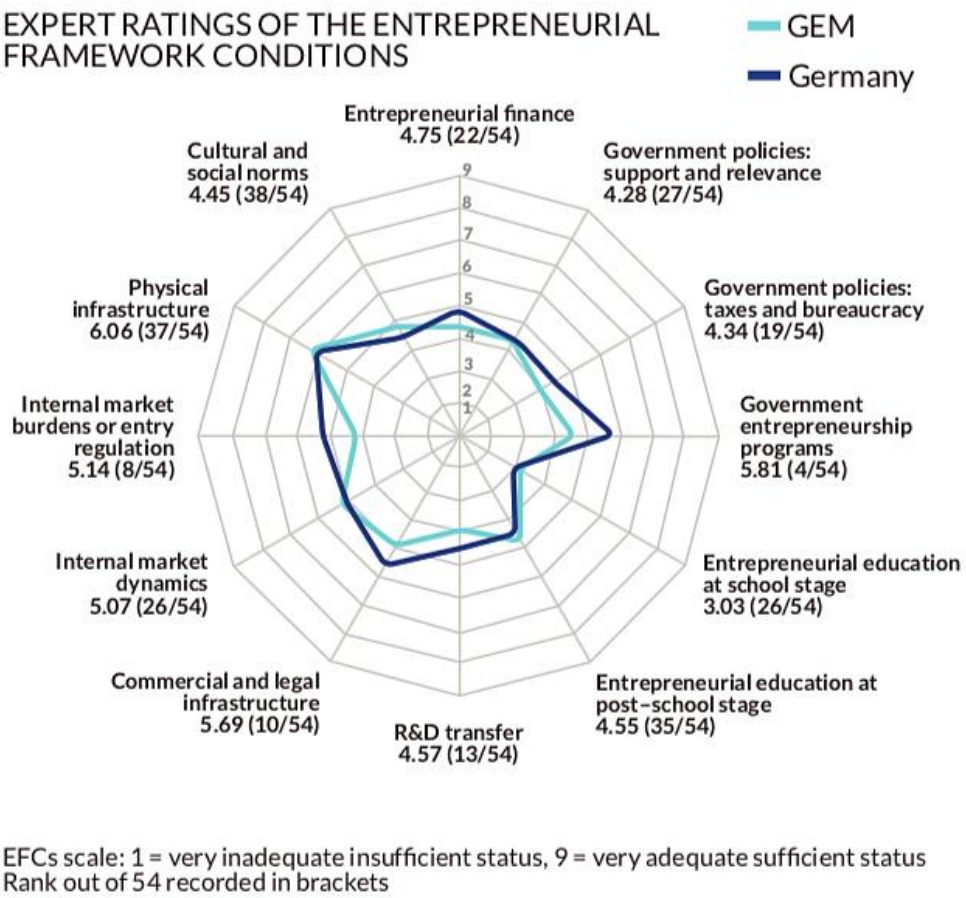

Figure 2. Expert Ratings of the Entrepreneurial Framework Conditions

(Source*:* Bosma and Kelley 2019, p. 79)

In addition to the global study, the national associations of GEM also provide an annual report about each country individually. The national report of GEM 2018/2019 provided by the German Economic Center of Rationalization and Innovation (RKW) also emphasizes the increasing awareness of entrepreneurship as well as the comparably low start-up activities in Germany, especially compared to neighboring countries such as the Netherlands and Austria (Sternberg et al. 2019, p. 9).

To summarize, Germany's entrepreneurial motivation is rising along with public support measures. University-based support facilities are particularly important in providing early-stage start-ups with financial resources and expert knowledge, which results in more efficient transfer of knowledge and technology through university spin-off companies. Nevertheless, to establish a solid national start-up ecosystem, all economic factors are of equal importance. Therefore, the next chapter provides a geographical overview and analyzes the main start-up hubs in Germany.

3.2 Germany's Main Start-up Hubs

Many factors influence entrepreneurial activities and a country's overall start-up ecosystem. In addition to political and economic factors, societal factors and geographical location must be considered. Most importantly, all factors mutually depend on and reciprocatively interplay with each other. This chapter focuses on the prominent start-up hubs in Germany and the geographical factors that influence them. Throughout recent years, Germany has developed a stable start-up ecosystem that includes a favorable market environment, a wide spectrum of supportive measures, and strong patent protection regulations (Sternberg et al. 2019, p. 10).

From a regional viewpoint, it can be stated that Berlin and North Rhine-Westphalia (NRW) represent Germany's main start-up hubs. Studies by the German Start-up Monitor selected Berlin in 2017 and NRW in 2018 and 2019 as the largest entrepreneurial regions with the highest growth (Kollmann et al. 2017; Kollmann et al. 2018, 2019).

Figure 3 illustrates the main start-up hubs as well as the start-up density in the respective federal state. In 2019, out of 1,933 analyzed start-ups, 20.6% were located in North Rhine-Westphalia and 16.1% in Berlin, followed by Bavaria with 12.9%, Baden-Wuerttemberg with 12.5%, and Saxony with 9.8%. The study of the German Start-up Monitor also highlights the city of Hamburg which, compared to its overall population density, exhibits a high start-up volume of 7.4%. The remaining federal states of Germany lag behind and account for only 7.3%. The cities of Berlin, Hamburg, and Munich possess a high start-up density. Additionally, Karlsruhe and Stuttgart in Baden-Wuerttemberg as well as the Rhine-Ruhr metropolitan region in NRW, comprise other start-up hotspots in Germany (Kollmann et al. 2019, pp. 26–27).

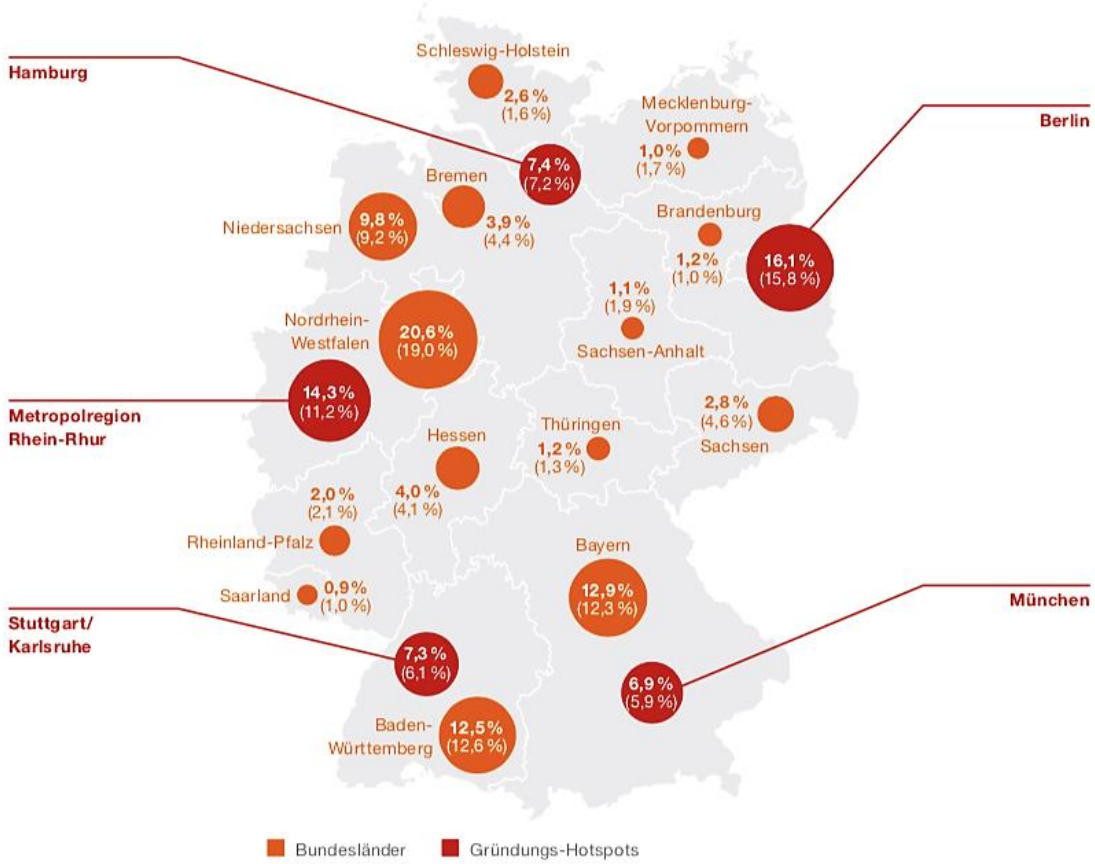

Figure 3. Start-up Headquarters According to Germany's Main Start-up Hubs and Federal States
(Source: Kollmann et al. 2019, p. 26)

The 2018 report of the EXIST program of the German Federal Ministry for Economic Affairs and Energy states that since 2017, 69% of the EXIST funding scholarships were granted to HEIs in Berlin. Moreover, between 2007 and 2018, a significant amount of scholarship funds were requested by the Technical University in Munich. Interestingly, the BMWi study indicates that 94% of granted start-ups located their operations in the region of their respective HEI (Bundesministerium für Wirtschaft und Energie 2019, p. 9).

The Center for European Economic Research (ZEW), namely, the IAB/ZEW Gründungspanel, publishes annual reports on entrepreneurial and innovation activities, financial structures, supportive measures, and sustainable entrepreneurial success. To compile its data, the IAB/ZEW Gründungspanel interviewed representatives of approximately 6,000 companies in Germany. An outstanding share of high-technology companies allows the IAB/ZEW Gründungspanel to examine detailed information about new business formation as well as the overall growth momentum across Germany. Moreover, in the past few years, the ZWE has particularly examined the German federal state Baden-Wuerttemberg, highlighting it as one of Germany's thriving high-tech hubs. Start-ups and entrepreneurial activities in this area have proved to possess strong growth potential and are focusing mainly on expansion. Moreover, support programs offered in Baden-Wuerttemberg enjoy exceptionally high demand (Gottschalk and Lubczyk 2019, p. 1).

Business innovations and the resulting high-tech start-ups are of vital importance politically as well as economically. With high-tech innovations, regional economic development increases as well as the overall regional economic power. The study of the IAB/ZEW Gründungspanel revealed that in the period from 2014 to 2017, 614,000 new businesses were established in Germany. In the year 2017 alone, the study estimated 154,000 start-ups. By comparison, from 2014 to 2017, 78,000 of those new businesses were established in Baden-Wuerttemberg, and in 2017 alone, that number was 19,000. Of particular note is that between 2014 and 2017, out of 78,000 new business formations in Baden-Wuerttemberg, 11.3% emerged in the high-tech sector. In comparison, all other German federal states account for only

7.1% of new high-tech business formations (Gottschalk and Lubczyk 2019, pp. 2–3).

Start-ups in Baden-Wuerttemberg are characterized by their distinct growth orientation. Moreover, the overall funding volume in Baden-Wuerttemberg is significantly higher compared to that found in other German federal states. Besides the growth-oriented nature of start-ups in Baden-Wuerttemberg, new business formations are also highly export-driven. In 2017, 14.8% of the overall revenue of start-up companies resulted from exports. The study of the IAB/ZEW Gründungspanel offers a possible explanation for the outstanding performance of the Baden-Wuerttemberg region by stating that start-ups between 2014 and 2017 emerged mostly due to new business ideas and recognized opportunities and generally did not emerge out of necessity (Gottschalk and Lubczyk 2019, pp. 5–8).

To summarize, start-ups in Baden-Wuerttemberg characterize themselves by a high growth and export orientation and a comparatively greater willingness to invest. Since most start-ups emerged by detecting new opportunities and new ideas, start-ups in Baden-Wuerttemberg have significant potential to establish themselves successfully in the market (Gottschalk and Lubczyk 2019, p. 10).

3.3. Trends in the German Start-up Ecosystem

Digitization, globalization, and sustainability are among many trends influencing and affecting the world today. Correspondingly, such trends also influence entrepreneurs, as they create room for new ideas and opportunities. In 2017, the German Start-up Monitor reported that the field of digitization plays a crucial role for German entrepreneurs (Kollmann et al. 2017, p. 7). In 2018, the study of the German Start-up Monitor reported that the overall spectrum of digitization has further expanded its range of opportunities. Today, topics such as augmented reality (AR), artificial intelligence (AI), virtual reality (VR), and blockchain are becoming relevant. As a result, in 2018, 54.4% of all respondents in the German Start-up Monitor study reported that digitization highly influences their business model and overall

entrepreneurial activities. Moreover, the field of AI has become increasingly important (Kollmann et al. 2018, p. 47). Comparing the data of the German Start-up Monitor from 2018 with 2019, it becomes apparent that digitization and AI are taking on ever-greater significance. In 2019, already 60.6% of all respondents stated that digitization affects their business activities. Furthermore, 40.4% of all respondents in 2019 acknowledged the ever-increasing relevance of AI (Kollmann et al. 2019, p. 37). Additionally, the growing importance of digitization was recognized by the EXIST program. In 2018, the report of the EXIST program of the German Federal Ministry for Economic Affairs and Energy stated that 58% of all provided scholarships had been granted to IT endeavors as well as the overall software sector (Bundesministerium für Wirtschaft und Energie 2019, p. 9).

Besides digitization and evolving technologies such as AI, German start-ups and entrepreneurs are also aiming at international expansion. In 2017 alone, more than 80% of all start-ups responding to the German Start-up Monitor intended or wanted to drive the process of internationalization further. Their primary targets are Europe, with 34.4%; the United States, with 13%; and Asia, with 7.8% (Kollmann et al. 2017, p. 58). In 2018, the trend toward internationalization decreased by almost 20% as only 60.1% of the start-ups aimed for international expansion (Kollmann et al. 2018, p. 70). Nevertheless, in 2019, the Start-up Monitor revealed that the desire for international expansion increased again, as 66.2% reported wanting to boost their international business. Moreover, Europe is still most attractive for start-ups regarding expansion (88.9%). A desire for internationalization is especially strong among start-ups with more than 50 employees: the German Start-up Monitor's study revealed that 88.7% of start-ups with more than 50 employees and only 53.9% of smaller start-ups tend to internationalize their businesses. However, start-ups with more than 50 employees already generate 38.7% of their revenue in foreign countries. The constantly growing interest in international expansion reveals the importance of further reducing potential obstacles concerning domestic markets, especially in Europe. Consequently, more start-ups would possess the ability to expand their business internationally (Kollmann et al. 2019, p. 52).

Overall, it can be stated that the German start-up ecosystem is influenced by international trends. Furthermore, more intergovernmental subsidy programs are entering the German market, which simultaneously increases the competitiveness. The internationalization of businesses has certain advantages for start-ups. However, due to rising competition in the entrepreneurial environment and the related support programs, the German government must guarantee a supportive, efficient, and attractive entrepreneurial ecosystem for start-ups to prevent entrepreneurial outflows. The objective still lies in the process of internationalization, which in turn represents new possibilities and potential for start-ups and entrepreneurs. Nevertheless, a strong national start-up ecosystem also assures a local settlement of new businesses (Zinke et al. 2018, pp. 18–19).

Besides internationalization and digitalization, thematic fields such as sustainability issues as well as social entrepreneurship represent global trends that also highly influence the German start-up ecosystem. The 2018 report of the German Start-up Monitor stated that in addition to the economic aspects, respondents are also concerned about ecological and societal factors of their businesses (Kollmann et al. 2018, p. 27). Start-ups in Germany carefully consider ecological and social factors as their draft their business models. As evidence, 86.5% of all respondents in 2018 stated that they highly value a sustainable business model (Kollmann et al. 2018, p. 54).

Furthermore, in 2018, more than 70% of all respondents reported prioritizing ecological aspects of their business operations. Moreover, 32.8% stated that their products or services are eco-friendly and therefore serve the environment. A total of 38.2% of start-ups seek to serve societal needs and therefore represent social entrepreneurs (Kollmann et al. 2018, p. 27). Comparing the data of 2018 with the German Start-up Monitor of 2019, it becomes apparent that the ecological factors of sustainability and societal challenges are of ever-growing importance for start-ups. In 2019, 36.6% of all respondents stated that their product or service serves the environment, and 41.9% stated that their business positively influences the overall social welfare (Kollmann et al. 2019, p. 38).

3.4 Improvement Potential in Germany

Rising entrepreneurialism and the resulting start-up formations in Germany require efficient supportive measures and innovative approaches. For this reason, concrete financial assistance, business model support, market intelligence, equipment, technologies, and laboratories represent the main resources ensuring the success of entrepreneurial start-ups. Therefore, the provision of necessary resources is of crucial importance to assure a stable and efficient start-up ecosystem. Identifying potential areas of improvement positively impacts and strengthens the overall entrepreneurial environment. Accordingly, this chapter introduces the primary potential threats to the German start-up ecosystem.

In 2017, the study of the German Start-up Monitor revealed that most of the respondents were unsatisfied with the support given to entrepreneurial instruction by the educational system (Kollmann et al. 2017, p. 79). Comparing the 2018 data with that from 2019, it becomes obvious that start-ups and entrepreneurs remain dissatisfied with the entrepreneurial education at schools and universities. As a result, the respondents seek an improvement in the current educational system, asking that entrepreneurial behavior be addressed at an early stage to boost awareness and motivation. The respondents state that early entrepreneurial education would encourage young people to become entrepreneurs in the future (Kollmann et al. 2018, 2019).

The study of the Global Entrepreneurship Monitor reinforces the prevailing dissatisfaction with early entrepreneurial education at schools as well as inadequate entrepreneurial education at German HEIs and universities. Since 1999, the study has reported unfavorable evaluations of entrepreneurial education overall and has since recorded a slow-moving improvement process (Sternberg et al. 2019, p. 48).

Apart from entrepreneurial education, the study of the Global Entrepreneurship Monitor analyzing the German start-up ecosystem also emphasizes the importance of digital education especially concerning the IT sector to ensure the availability of a more skilled workforce in the future. Furthermore, a key objective of the educational

program should be the creation of an innovative and creative mindset (Sternberg et al. 2019, p. 11).

In addition to the suggested changes in the overall German educational system, the study by the institution for innovation and technology also disclosed the need for improvements in the support environment, especially at HEIs and universities. The study revealed a rising demand for support programs at HEIs and universities, as they offer well-developed infrastructures along with expert knowledge, highly developed technologies, and well-equipped laboratories. As a consequence of the rising demand for support facilities at HEIs and universities, it is important to ensure financial as well as human resources and a well-developed infrastructure (Zinke et al. 2018, pp. 160–161).

Moreover, because of the wide range of support facilities and programs, quality levels of the provided services or available equipment should be explicitly and transparently disclosed. This would positively impact a start-up's selection process by saving valuable time and reducing the risk of choosing an inappropriate support facility or program. Furthermore, the study by the institution for innovation and technology states that higher transparency levels would lead to more competitive behavior by the providers, which in turn could create an innovation-driven market. More specifically, the study respondents stated that incubator programs should provide more financial resources, improve contact points with potential investors, and actively support the commercialization process. Accelerator programs should expand their focus by offering more support measures for early-stage start-ups, and makerspaces and coworking spaces should increase the overall performance capacity by receiving greater support from the public domain. Furthermore, start-up centers should professionalize their advisory services and expand their infrastructure and network (Zinke et al. 2018, pp. 169–170).

Nevertheless, besides the improvement suggestions for the educational system and support facilities, the allocation of financial resources represents another critical factor influencing the German start-up ecosystem. Start-ups possess the ability to raise capital from public and private investors (Sternberg et al. 2019, p. 51).

The German Start-up Monitor's 2019 study revealed considerable room for improvement in the provision of financial resources and the accumulation of capital. The excessive gap between a start-up's used and actual preferred capital constitutes a potential threat to the company's growth potential. The German Start-up Monitor revealed that personal savings continue to represent the most-used financing source for start-ups, accounting for 80.3%. Nevertheless, personal savings as well as funds invested by family or friends represent rarely the preferred option for start-ups. As a result, 23.1% of all respondents used state subsidies, but 51.6% of start-ups stated a preference for state subsidies. Other examples are the use of venture capital, with 14.6% of start-ups actually receiving it compared to 39.7% desiring it, and business angels, with 23.1% receiving this support compared to 38.5% desiring it. The data provided by the Germen Start-up Monitor in 2019 demonstrates the gap between provided and actual needed capital. As a consequence, the provision of financial resources and the overall financial capacities pose significant challenges to the German start-up ecosystem (Kollmann et al. 2019, p. 46).

4. Methodology

4.1 Research Questions

- What does incubation mean, and what makes it successful?

- Which universities are the main actors and innovation drivers in Germany, and what makes them successful?

- How do universities structure and organize an entrepreneurial support system, and how does it influence the entrepreneurial motivation on campus?

4.2 Research Design

The primary objective of this research lies in identification of the overall organizational structure of support facilities, equipment provided, and services offered to start-ups and entrepreneurs, and identification of success factors of various entrepreneurial institutions as well as the overall entrepreneurial motivation at universities and HEIs in Germany. Moreover, this study aims to distinguish among various support approaches, focusing particularly on the incubation approach. For this reason, this research is premised on a qualitative research base. Therefore, primary data have been gathered through expert interviews to ensure the compilation of relevant and meaningful data and an in-depth understanding of the entrepreneurial support environment of the respective university or HEI.

Referring to the purpose of this research, a qualitative research approach is favorable, as qualitative data is premised on an individual's understanding, perception, and personal views concerning the research topic. Moreover, compared to quantitative data, which are usually numerical-based, a qualitative research approach represents non-numerical data. In this respect, qualitative data is particularly advantageous for the analysis of the respective entrepreneurial support environments, as respondents are able to clearly express their experiences as well as personal opinions. Nevertheless, different connotations and a large interpretation

scope of the data require significant attention during the evaluation process to guarantee meaningful research findings (Saunders 2012, p. 546).

As this research is qualitative in nature and aims to gain new understanding, in-depth knowledge, and a new perspective on the present research topic, an exploratory analysis is favorable. An exploratory study is beneficial especially in regard to expert interviews, due to its non-structured and open research nature. This means that respondents are able to freely express thoughts, experiences, and individual perceptions. Moreover, the field of entrepreneurship at universities and HEIs and particularly the great variety of offers and support measures represent a favorable condition in which to conduct an exploratory study, as such a comprehensive research topic follows a more finite research path during the analysis process (Saunders 2012, p. 171).

4.3 Research Method

Considering the research purpose, primary data have been gathered through research interviews. In qualitative research, interviews represent a method that allows the researcher to collect profound and solid data that decisively contribute to accomplishing the purpose of the research. To gather meaningful data and conclusive results, it is important to develop incisive and clear questions to guarantee a substantial contribution from the interviewee. For this reason, significant and relevant questions as well as focused attention during the interview are the prominent factors assuring meaningful research outcomes. Depending on the research design and the overall research goal, the interview style as well as the interview structure should be consistently adjusted to the research requirements (Saunders 2012, p. 372).

Therefore, the following chapters outline the interview style and the interview form that have been used in the present research to ensure significant research results.

4.3.1 Expert Interviews

As this research aims to gain insights that further the understanding of the entrepreneurial support environment at German universities and HEIs, expert interviews are appropriate. Therefore, it is essential to gather expert knowledge from individuals who are directly connected to such an environment, and it is important to determine the main actors who contribute to the present research objective (Adams 2014, p. 143).

To identify the main participants in the field of entrepreneurship and entrepreneurial support in Germany, the focus is placed on academic institutions such as universities and HEIs. Moreover, the experts at the respective university or HEI should be directly involved or actively participate in the field of entrepreneurship or entrepreneurial support to be able to respond accordingly, which in turn ensures the validity and the reliability of the data collection.

4.3.2 Expert Definition

The Cambridge Dictionary by the Cambridge University Press defines an expert as follows:

> *"A person with a high level of knowledge or skill relating to a particular subject or activity." (Cambridge Dictionary 2020)*

The Cambridge Dictionary definition demonstrates the importance of the selection process involving the interview partners to successfully accomplish and substantiate the present research objective. Therefore, the experts selected for this research must be substantially involved and must participate directly in the field of entrepreneurship or work in the entrepreneurial support environment at the respective university or HEI. Consequently, the interviewees must possess comprehensive expertise through their direct involvement in this subject area. Accordingly, the first-hand experience gained by the experts positively influences the research outcome and strengthens the scientific quality of the present research

work. Moreover, the selected universities and HEIs must be actively committed to entrepreneurship through educational activities or by offering general entrepreneurial support measures on campus. For this reason, the focus is on universities and HEIs that build an entrepreneurial environment on campus by providing opportunities for students to learn about entrepreneurial possibilities, and develop new business models, and start a new business while being directly supported by their university or HEI.

4.3.3 Type of Expert Interview

This type of research interview represents an exploratory research approach, which generally aims to provide the researcher an opportunity to explore the research topic (Adams 2014, p. 143). Therefore, the present research uses non-standardized and semi-structured expert interviews. In qualitative research, semi-structured interviews demonstrate a compilation of the main subjects according to the research question, which is composed into potential guiding questions. Nevertheless, this research approach offers the researcher the opportunity to gain insights, as the deployment of the guiding questions can differ slightly in each interview. This means that some questions can be adjusted during the interview aligned to the respective university or HEI (Saunders 2012, pp. 374–375).

Structured and standardized interviews represent a highly formalized type of interviews in which the researcher is bounded by a set of previously defined questions that leave little opportunity for exploration. Moreover, the sequence and tonality used in each interview must be consistent to avoid systematic deviation, which can negatively influence the research outcome. Furthermore, structured interviews are mostly applied in research studies where measurable data are gathered (Saunders 2012, p. 374).

On the contrary, the research approach of an unstructured and non-standardized interview represents the most formless type of interview. This research approach offers the researcher the possibility for an open communication in which the

respondents are able to express themselves without restrictions and without being limited to preconceived questions (Saunders 2012, p. 375).

Through semi-structured interviews, the researcher possesses greater opportunities to explore responses where questions are based on each other and depend on the explanation from the respondent, which in turn positively influences the process of gathering meaningful and valid data. Furthermore, semi-structured interviews also create open conversations that increase the opportunity to explore new ideas and approaches, thereby leading to significant conclusions (Saunders 2012, p. 378).

Therefore, considering this research objective, non-standardized and semi-structured interviews represent the most suitable approach to result in meaningful outcomes. Moreover, this approach offers the researcher the opportunity to explore different ways of thinking as well as multiple operational structures of the respective university or HEI.

The field of entrepreneurial support and the overall entrepreneurial environment vary among each academic institution. Therefore, it is essential to provide the interviewees an opportunity to express their thoughts through an open conversation. However, of equal importance is the preparation of some guiding questions to explore the relevant areas that apply to the research objective.

4.4 Data Collection

The following section outlines the data collection process as well as the examination method used in the present research study. Consequently, the identification procedure concerning the experts at relevant universities and HEIs is presented. Key determinants during the selection process are outlined to provide a better understanding concerning the research process.

Furthermore, the interview structure as well as the interview procedure applied in this research are described to strengthen the comprehensibility as well as transparency of the study. Nevertheless, the interviewees and their respective

university or HEI will be anonymized. The last section outlines the applied evaluation tool. For this reason, the interpretation concept is described to gain a better understanding concerning the nature of the collected data and the resulting research outcomes. The main tools are the qualitative content analyses by Philipp Mayring (Mayring 2015) and the qualitative data analysis software MAXQDA (MAXQDA 2020).

4.4.1 Description of Experts

Concerning the research objective, it is important to identify the appropriate interview partners so as to gather meaningful and significant data. Moreover, the experts must be directly involved in an academic entrepreneurial environment and be able to share necessary experience and knowledge gained in the research field. Consequently, the author of this research established some key qualifications concerning the experts as well as the respective university or HEI that must be fulfilled:

- The university or HEI should actively support students in any manner regarding entrepreneurship and entrepreneurial opportunities; and
- The interviewee must be involved in any manner in the entrepreneurial environment at the respective university or actively participate in the field of entrepreneurship

To guarantee the fulfilment of the key determinants, the study of the German Start-up Monitor, which served as a basis for the analysis of the overall German start-up ecosystem (see Chapter 3), has been utilized to select relevant German universities or HEIs. The German Start-up Monitor publishes annual data about the best entrepreneurial universities and HEIs throughout Germany. Accordingly, every year the study ranks the best 10 academic institutions providing excellent entrepreneurial support services for start-up activities at the respective university or HEI as well as the ratio of new business formations (Kollmann et al. 2019, p. 33).

Therefore, the 10 best entrepreneurial universities or HEIs published in the German Start-up Monitor of 2019, 2018, and 2017 (Kollmann et al. 2019, 2018; Kollmann et al. 2017) were selected due to their excellent entrepreneurial support environment and their high start-up ratio. Consequently, the experience and knowledge of potential interviewees at these universities or HEIs strengthen the research outcome because of their direct involvement and first-hand experiences. Moreover, success factors as well as the cultural uniqueness of the respective university or HEI can be determined, leading to new ideas, methods viewpoints, and innovative approaches that have not been observed previously (Saunders 2012, p. 378). After comparing the data of the German Start-up Monitor of 2019, 2018, and 2017 (Kollmann et al. 2019, 2018; Kollmann et al. 2017), 13 universities and three HEIs were selected.

The next step represented the analysis of potential experts at the respective institutions. Therefore, extensive internet research was conducted to identify potential interview partners. The first step involved the identification of the entrepreneurial facility at the academic institution to find individuals who are involved or actively participate in the field of entrepreneurship. Therefore, the function of the potential interviewee played a crucial role during the research process. By analyzing the relevant web pages, contact information, mainly email addresses, were discovered and were used to reach out to the potential interviewees.

After all relevant contact information were compiled and email requests were sent to the potential interview partners, 13 universities and two HEIs responded, and eight agreed to be interviewed. As a result, in the period from January to April 2020, the author conducted a total of eight expert interviews. All eight interviewees are directly involved in the field of entrepreneurship and are working or operating in the entrepreneurial support system at their respective university or HEI.

4.4.2 Interview Structure

To construct a coherent interview guide and to ensure an effective interview procedure, it is important to create a profound knowledge base about the research topic (Saunders 2012, p. 384). Therefore, the first step of the preparation process concerning the expert interviews was an extensive literature research review focused on the relevant aspects of the research topic. The process of developing a fundamental theoretical background and analyzing the organizational as well as structural design of the current German entrepreneurial environment at academic institutions was quite helpful in the quest to obtain the necessary knowledge base (see Chapter 2 and 3).

Acquiring knowledge beforehand ensures the quality of the collected data and assures the convergence of the focal area of the research topic (Saunders 2012, p. 386). Therefore, the next step is the establishment of guiding questions aligned with the theoretical background and adjusted to the research questions and, as a result, representing the overall interview guide (see Appendix A). The sequence of the interview questions as well as their phraseology must be understandable and consistently constructed to eliminate incomprehensibility and to ensure explicitness and clarity of the prepared questions (Saunders 2012, p. 386).

Therefore, an adequate method of formulation and a suitable questioning technique were used during the interviews, thereby decreasing the uncertainty of the collected data and strengthening their validity (Saunders 2012, p. 389). Each interview began with some closed-ended questions, eliciting mostly yes or no answers, as well as some questions about the facility designed to collect certain facts and data. This is a common interview technique that is used mostly at the beginning of an interview (Saunders 2012, p. 392).

Consequently, the first questions comprise the entry requirements, for instance, chronological sequences about facility use, application processes, potential admission charges, and possible industry focal points affecting entrepreneurs or start-ups at the respective university or HEI. Moreover, questions concerning the

services as well as the supplied equipment are included. It is of crucial importance to identify the main services offered to guarantee an effective support environment that drives successful start-ups and entrepreneurs. The final questions posed in the general part of the interview represent organizational matters, for instance, the financial structure, the cooperation with other universities or HEIs, and the employment structure, mainly concerning start-up supervision.

Accordingly, the first section of the interview guide comprises 11 questions that seek to identify the overall structure and design of the respective university or HEI. Moreover, to guarantee sufficient information to permit significant and conclusive results, some questions are indicated with examples that have been named during the interview to ensure comprehensibility of the question. Additionally, some questions include specific sub-questions to ensure an adequate usability as well as comparability among the various interviews.

The second part of the interview guide comprises six open-ended questions. This type of questioning helps to analyze various viewpoints as well as interpretative approaches led by an exchange of individual opinions and ideas. Moreover, it is used to disclose personal perspectives by allowing the interviewees to freely express their thoughts (Saunders 2012, p. 391). Therefore, questions that address identification of the terms of the respective facility as well as personal interpretations of terms were asked to provide clear understanding of the various terms used in the field of entrepreneurship and especially in the support environment.

Questions addressing personal opinions include, for instance, individual views of the respective university or HEI concerning its uniqueness or success factors perceived by the interviewee as well as the personal interpretation of the overall German entrepreneurial environment. Additionally, questions regarding entrepreneurial trends as well as entrepreneurial motivation through educational programs and entrepreneurial events were asked; they are crucial to identify and understand strong motivational factors at the respective university or HEI. For this reason, the second part of the interview guide features individual viewpoints and therefore ensures the

dissemination of knowledge and the transfer of first-hand experiences, which in turn strengthen the research outcomes.

4.4.3 Interview Procedure

When relevant facts about the research topic and the research objective are provided to the experts prior to their interviews, the interviewer's authenticity and reliability are supported, since the interviewee is able to form a first impression about the specific research area (Saunders 2012, p. 385).

Consequently, the email requests sent to the respective experts contained a general overview of the research work, the main focus areas, and the research objective. Moreover, to circumvent interviewee bias, a comprehensive preparation process was required (Saunders 2012, p. 383). Therefore, before each interview the author acquired valuable information about the respective academic institution as well as the entrepreneurial facility by conducting internet research.

After the experts confirmed their interviews, each signed a written declaration of consent (see Appendix A) before the interview began. By signing that declaration, the interviewees granted their approval to the interviewer to audio-record the interviews only for analysis and transcription purposes. However, as stated in the declaration of consent, all data gathered during these interviews were fully anonymized. Moreover, interview arrangements such as date, time, and interview style had been made separately for each expert via email.

At the beginning of an interview, it is important to ensure the authenticity of the interviewee. Therefore, it is the responsibility of the interviewer to find an appropriate opening (Saunders 2012, p. 389). Moreover, to minimize unreliability and to double-check the expert's approval of an audio record, the interviewer personally asked once again for permission before beginning the interview.

Table 1 indicates the duration as well as the interview style of each interview (I). The first interview (I1) was conducted on-site through and face-to-face. However, the remaining interviews were conducted via telephone and through video conferencing

(I8) mainly due to geographical distances. The interviews were audio-recorded to ensure comprehensive and significant data collection. Moreover, this method of data collection ensures that specific details or peculiarities will not be omitted from the data set. This method proves to be ideally suited for telephone interviews due to the fast pace of conversation which makes note-taking as a means of data collection quite challenging (Saunders 2012, p. 405). However, besides audio-recording, the interviewer also made some personal notes during the interviews to ensure a qualitative comprehension in case of a system outage or service disruption. Moreover, this method allowed the interviewer to directly and instantly capture thoughts and ideas (Saunders 2012, p. 394).

Interview	Duration (min)	Interview Style
I1	45:10	Face-to-Face
I2	41:52	Telephone
I3	16:27	Telephone
I4	18:12	Telephone
I5	21:23	Telephone
I6	34:08	Telephone
I7	24:11	Telephone
I8	38:24	Video Conferencing

Table 1. Interview Details

Furthermore, the majority of the interviews were conducted in the German language, with only one carried out in English. Therefore, to obviate the risk of data inconsistencies, because of linguistic differences, the interview guide was correspondingly and logically translated into English (see Appendix A).

As Table 1 indicates, the duration of the interviews varied because of the different interview styles, different speech rates, and the detailed nature of the answers. Accordingly, the average time for all interviews is approximately 30 minutes.

After the interviews were concluded, each audio-recording was transcribed by the author; those transcripts are provided in the Annex (see Annex A). Consequently, this process represents the written form of the audio file of the respective interview (Saunders 2012, p. 550). The transcripts allow the author to analyze and evaluate the collected data by building relevant categories and codes.

4.4.4 Qualitative Content Analysis by Philipp Mayring

A content analysis represents an analysis method that is based on an emblematic form of material gathered through communication processes, for instance, images as well as written documents. Moreover, this analysis method provides the researcher with a structural and methodical procedure to evaluate collected data sets. Various requirements and evaluation principles ensure an accurate analysis process and the transparency of all assessment phases during the evaluation process to guarantee validity and comprehensibility. Furthermore, a content analysis characterized not only by various evaluation principles. Another crucial factor is the development of a comprehensive theoretical background that guides the research through theoretically derived questions and a resulting framework for interpretation. The primary goal of a content analysis is to acquire the ability to draw conclusions from the existing material. In conclusion, a qualitative content analysis aims to analyze a communicational set of data through a systematical and theoretical approach, directed by guiding principles (Mayring 2015, pp. 12–13).

Philipp Mayring outlines eight characteristics that demonstrate the main body of a qualitative content analysis (Mayring 2015, pp. 50–54):

(1) The embedment of the material into a communicational context;
(2) A systematic and rule-based approach;
(3) Categories as the main center of the analysis;

(4) An object-related technique instead of an invariable technique;
(5) Examination of the specific instruments through a pilot study;
(6) Theory-driven analysis;
(7) Inclusion of quantitative analysis steps; and
(8) Quality criterion

The first attribute (1) represents the importance of the maintenance of the communicational context during the process. This means that the interpretation process lies invariably within the context. The second attribute (2) demonstrates the determination of a specific procedure during the analysis, which serves as an orientation guide and in turn imparts the transparency of the overall process. Nevertheless, this procedure must be adjusted and aligned to the respective research material. Another main attribute concerning the qualitive content analysis represents the establishment of category (3). Mayring indicates that the category system of a content analysis is crucial, as it demonstrates the central tool to guarantee comprehensibility as well as traceability of the analysis process. Another characteristic represents the object-related procedure (4). This means that the process must be adjusted to the material being analyzed and cannot be arbitrarily applied. The qualitative content analysis represents three main approaches that can be used to analyze the respective material, namely, content summary, content explication, and content structuring. After developing a contextual procedure and establishing a coding system, a trial round must be implemented to examine and optionally modify the process (5). Furthermore, procedural decisions must be theory-driven to avoid vagueness (6). The seventh attribute (7) represents the integration of quantitative analytical steps into the qualitative content analysis, for instance, during analysis where the frequency of a category is substantial in regard to the research outcome. The last characteristic (8) represents the quality criterion concerning the research outcome, namely, reliability objectivity as well as validity (Mayring 2015, pp. 50–54).

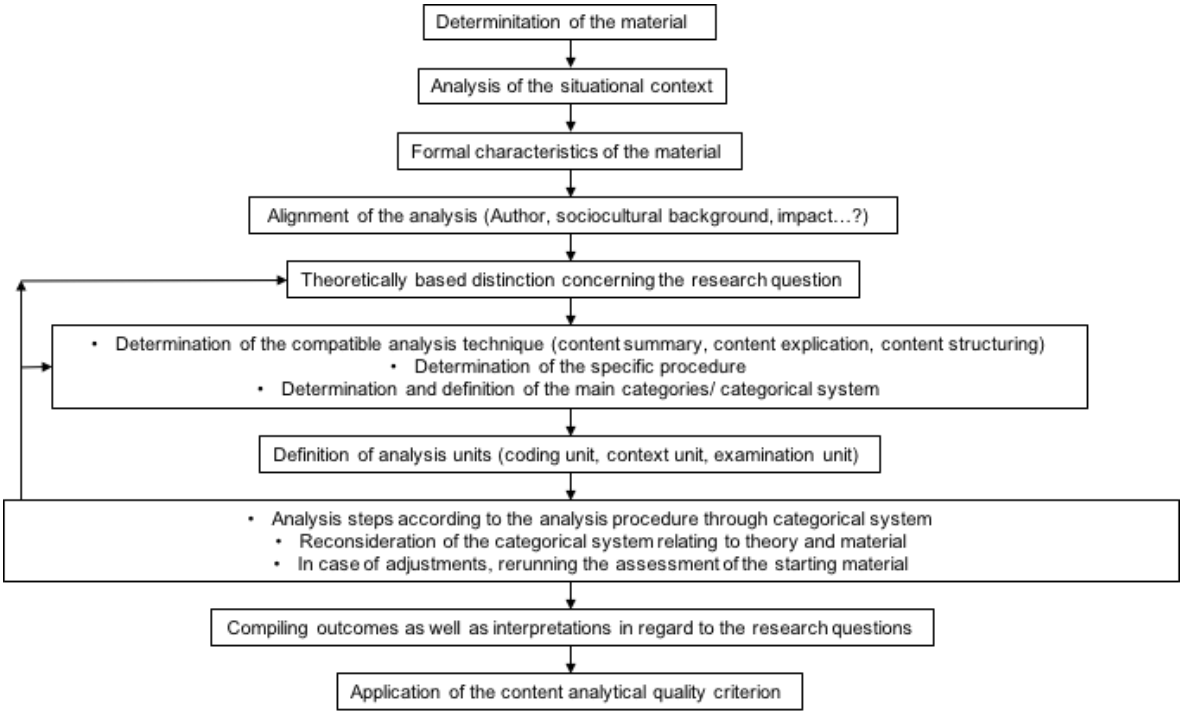

Figure 4. General Model of the Content Analytical Procedure
(Source: Mayring 2015, p. 62, english translation)

Figure 4 represents a general model of the overall content analytical procedure. The model demonstrates various analytical steps that must be considered and that in turn increase the transparency and comprehensibility of the overall methodical approach (Mayring 2015, p. 61). In the following, each analytical step will be determined and adapted to the present research study.

Procedure

At the beginning of the qualitative content analysis it is important to determine the primary material that will be analyzed during the process. Mayring indicates three steps for consideration: ***the determination of the material, the analysis of the situational conditions,*** and ***the formal characteristics of the material*** (Mayring 2015, pp. 54–55).

Considering the present research work, the three steps transferred to the present research emerge as follows:

(1) Determination of the material

- Establishment of a comprehensive theoretical background
- Relevant research studies concerning the research topic
- The interview guide, which represents guiding questions adjusted to the main research question and the overall research objective
- Transcript of the respective interview

(2) Analysis of the situational condition

- Semi-structured non-standardized expert interviews were conducted
- Experts were identified through relevant research studies
- Participation was on a voluntary basis
- Interview requests were sent via email
- Interview style depended on geographical location: telephone, video conferencing, or face-to-face

(3) *Formal characteristics of the material*

- Personal notes were taken during the interview to ensure a qualitative comprehension
- Audio-recording of the interviews was used for transcription purposes
- Transcripts of the respective interviews were created

The next step in the qualitative content analysis by Mayring is the definition of the interpretative scope. Therefore, the essential core and the corresponding essence that requires interpretation to comply with the research objective must be defined. Accordingly, two further steps must be clarified to ensure the correct application of the qualitative content analysis, namely, ***the alignment of the analysis*** and ***the theoretically based distinction concerning the research question*** (Mayring 2015, p. 58), which can be exemplified as follows:

(1) Alignment of the analysis

- The material aims to gather profound knowledge from experts
- The interview guide is designed to gather first-hand experience from the expert concerning the research purpose
- Relevant text passages aligned to the research questions are interpreted and analyzed
- Interpretation and analysis of the relevant text passages are performed on a subject-matter basis
- The interpretation scope is centered around the respective field of action and the unity of action to observe different action processes

(2) *Theoretically based distinction concerning the research question*

- Comprehensive theoretical background to gather profound knowledge by analyzing relevant research studies
- Research questions derived through theoretical knowledge guiding the research approach
- Systematic approach driven by the research questions building on existing knowledge (theoretical background), transferring it to the intended research (research questions), and acquiring new conclusions (research objective)

After defining the primary material, reviewing the overall situational condition and the interpretation scheme, and outlining the theoretical foundation, the analysis technique must be constructed and aligned to the present research work. This step includes the determination of the specific unit of analysis comprising the coding, context, and evaluation unit. However, the coding unit and the resulting coding system represent the most important step during a qualitative content analysis. The coding system is based on the acquired knowledge through the theoretical background, the resulting research questions, and the present material. Moreover, the coding system is built on allocation rules that contribute to the transparency and verifiability of the research (Mayring 2015, p. 61).

For this reason, the analysis technique essentially describes the applied interpretation style. By characterizing the interpretation style, specific interpretation approaches can be determined (Mayring 2015, p. 65). Mayring differentiates among three different interpretation styles, namely, the content summary, the content explication, and the content structuring technique. The technique of content summary aims to reduce the quantity of the material as much as possible to obtain a clear position of the relevant content units in the starting material. The technique of content explication uses additional material to interpret problematic content units more precisely. The technique of content structuring aims to analyze specific aspects extracted from the starting material through predetermined criteria (Mayring 2015, p. 67). Nevertheless, further differentiation is required and essential to explain the overall interpretation approach (Mayring 2015, p. 68):

(1) Summary

(a) Summary

(b) Inductive coding scheme

(2) Explication

(a) Narrow context analysis

(b) Wide context analysis

(3) Structuring (deductive coding scheme)

(a) Formal structuring

(b) Textual structuring

(c) Type-specific structuring

(d) Scalable structuring

Concerning the present research study, the most suitable analysis technique represents the content structuring method, more specifically the textual structuring technique, which follows a deductive approach. This means the main categories of the category system will be pre-determined before analysis of the respective material (Mayring 2015, p. 68). The aim is to extract a specific and systematic structure of the

starting material through pre-determined categories. The category system refers to the main textual components that require analysis and interpretation. Consequently, the essential core material is extracted through established categories. During this procedure, it is of crucial importance to precisely define the structural dimension aligned to the research questions and derived from the theoretical background. All dimensions as well as their corresponding characteristics are compiled into a coding guideline. Therefore, the coding guideline comprises the pre-determined categories, a precise definition of the respective categories, and prime examples of all categories to ensure a comprehensible approach as well as the respective coding rules that guarantee an exact assignment of various textual components (Mayring 2015, p. 97).

Transferring it to the present research work, the author pre-determined nine categories (C) aligned to the research questions as well as the research objective and adjusted to the theoretical background. Furthermore, two main categories comprise different subcategories to assure a reasonable structure and clarity of the overall data set. As a result, the main categories are defined as follows:

(C1) Accessibility

(a) Application procedure
(b) Admission charges
(c) Time limits
(d) Industry factors
(e) Start-up development phase

(C2) Offered Service

(C3) Equipment

(C4) Organizational Elements

(a) Organizational identification
(b) Financial structure
(c) Collaborations
(d) Employees

(e) Average number of start-ups supervised

(C5) Entrepreneurial Motivation

(C6) Uniqueness and Critical Success Factors

(C7) Start-up Trends

(C8) Characteristics of an Incubator at Universities and HEIs

(C9) Perception of the German Start-up Ecosystem

Furthermore, on the basis of the present research, an appropriate coding guideline was established by the author comprising exact definitions, prime examples, and the coding rule of the respective category to guarantee a simple traceability of the procedure and to strengthen the transparency of the research (see Appendix B).

A first trial run of the category system as it relates to the starting material demonstrated the accuracy of the respective categories and their corresponding definitions as well as coding rules. During the first trial run, textual components were determined on the basis of the category systems. Subsequently, insufficiently defined categories were reconsidered and adjusted until a precise division among all categories was clear (Mayring 2015, pp. 97–99).

To guarantee a precise and qualitative procedure, the software program MAXQDA was used to evaluate the expert interviews with reference to the generated coding guideline.

4.4.5 MAXQDA

MAXQDA is a software program designed to conduct qualitative research analyses. The program offers the ability to insert the material that needs to be analyzed, for example, audio files or transcripts. After the relevant material is inserted, the respective textual components can be individually coded and systematically structured. Furthermore, the program offers the ability to illustrate and visualize coded fragments of the materiel. As a result, conspicuities as well as coding

incidence’s and the diffusion of the data set, as it determines interconnections and data patterns, can be depicted through various visualization instruments (MAXQDA 2020).

After transcribing the expert interviews, compiling the category system, and establishing the coding guideline, MAXQDA was used by the author to analyze the respective textual components of the transcripts (see Annex B). In the end, visualization tools were used to display the research outcome more clearly.

5. Research Findings

The following section contains the findings of the present research study. Accordingly, the evaluation of the gathered data is classified by the respective category (C1-C9) of the coding guideline (see Appendix B). This ensures a comprehensive as well as clear and transparent overview of the research outcomes. Moreover, the relevant data is visualized through charts and graphs to guarantee a compact presentation of the data set.

5.1 Accessibility

The first category, namely, accessibility, comprises five subcategories. The first subcategory evaluates the application process of the respective university (Figure 5). After analyzing the relevant textual content, it became apparent that only two universities have a comprehensive application procedure for their entrepreneurial facility. Therefore, 25% feature an application process. Moreover, one respondent also indicated a restriction concerning the number of start-ups at the respective facility. As a result, only 15 start-ups can take part in the support program at that university.

Consequently, 75% of all entrepreneurial facilities do not possess a comprehensive application procedure. However, two experts indicated that an information sheet is required to gather a first impression of the start-up project. Nevertheless, this information sheet does not serve as a selection criterion and therefore does not determine the use of the existing facilities. Accordingly, all six experts where applications are not employed emphasized the openness of their facilities and the unrestricted access. Moreover, the majority of the respondents also highlighted the fact that the number of start-ups being supervised or supported is not restricted to a specific number but rather is limited by the available capacity at the respective university or HEI.

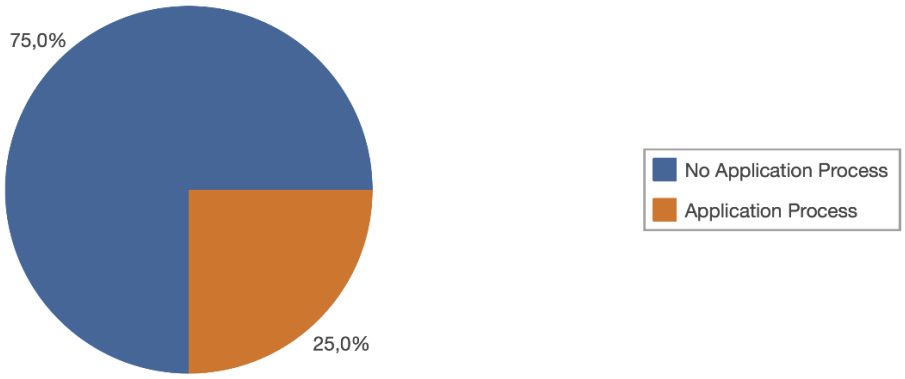

Figure 5. Application Procedure

The second subcategory comprises the admission charges in terms of rental fees, use charges for the equipment, and overall fees for services provided to the start-ups at the respective university or HEI. As Figure 6 demonstrates, all eight of the entrepreneurial facilities do not charge any admission fees and therefore provide their services as well as equipment free of charge.

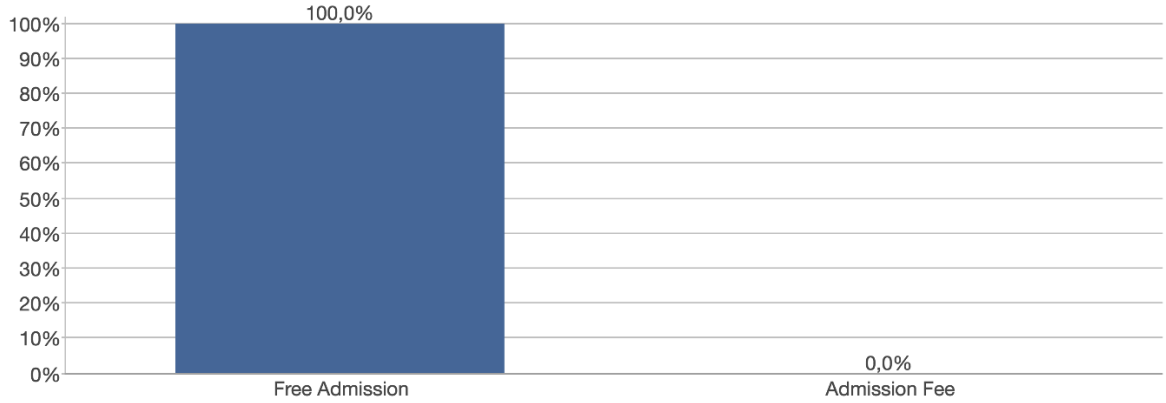

Figure 6. Admission Charges

Another access criterion is the potential time limit for use of the facility established by the respective university or HEI. Therefore, this subcategory aims to gather information about possible time restrictions. It is apparent from the results that the majority (87.5%) do not possess a specific time limit and are therefore accessible for an indefinite period of time. This indicates that start-ups as well as entrepreneurs

have access to a large majority of the facilities without any time restrictions. Accordingly, only one respondent (12.5%) indicated a time restriction of six months, as illustrated in Figure 7.

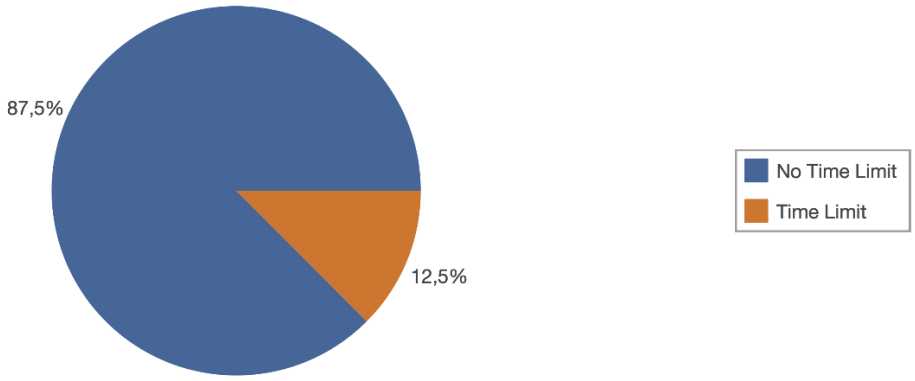

Figure 7. Time Limits

Besides time restrictions, admission charges, and application processes, another factor concerning facility access is the specific development stage of the start-ups being supervised. During the evaluation process, two distinctions became apparent.

Figure 8 indicates that either all start-up stages are supervised or the respective entrepreneurial facility has a strong propensity toward early-stage start-ups. In other words, exactly 50% of the respondents indicated that their entrepreneurial institutions focus mostly on early-stage start-ups or seed companies.

Accordingly, the other 50% stated that their respective institutions accommodate all start-up stages, not drawing any distinctions between the various stages. Nevertheless, most of the respondents also emphasized the fact that although all stages are supervised, the majority of start-ups are still early-stage start-ups.

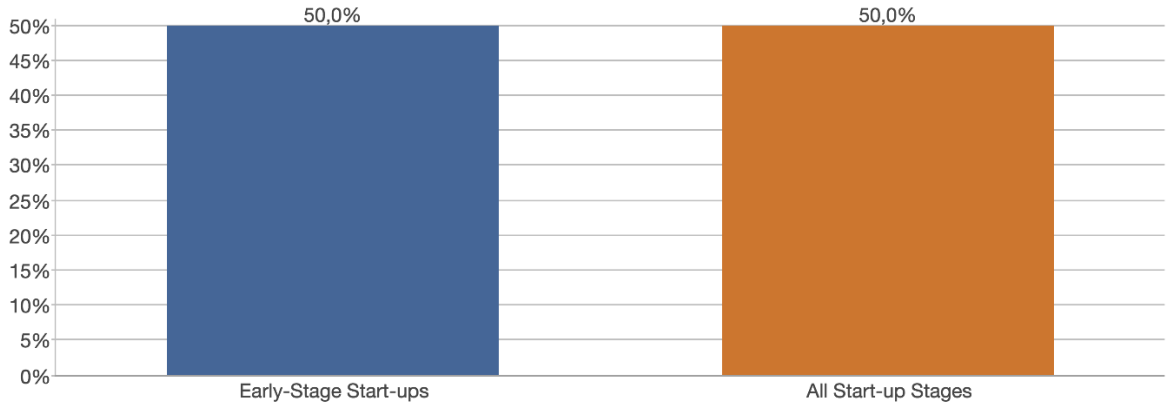

Figure 8. Development Stage of Start-up

As indicated in Figure 9, the last subsection addresses the potential industry focus by the respective institution. This means that only start-ups that operate in a specific industry or sector, for instance, IT or business are supported or may be part of a support program. When asked whether their respective institutions possess an industry focus, 87.5% of the respondents reported that their entrepreneurial facility does not focus on a specific industry sector. Moreover, some experts emphasized the diversity of academic majors at their university, which results in many avenues for entrepreneurial opportunities in a wide variety of business sectors.

As a consequence, restriction of specific industrial areas would decrease the entrepreneurial potential at the respective university. Therefore, most experts stated that with a specific industry-sector focus, the university would be unable to explore the full entrepreneurial and innovation potential at their institution. Nevertheless, universities that focus on a specific academic education, for instance, technical universities or business universities emphasized that new business ideas are over-proportionally within the respective major field of study.

However, as Figure 9 illustrates, one respondent (12.5%) indicated that the entrepreneurial institution focuses on a specific industry and therefore has a certain field of interest. As a result, the institution mainly supports technology- and knowledge-based start-ups. The respondent emphasized the fundamental knowledge concerning the field of scientific research and the resulting high-quality

consultation. Moreover, the institution aims to differentiate itself by focusing on a specific field of application.

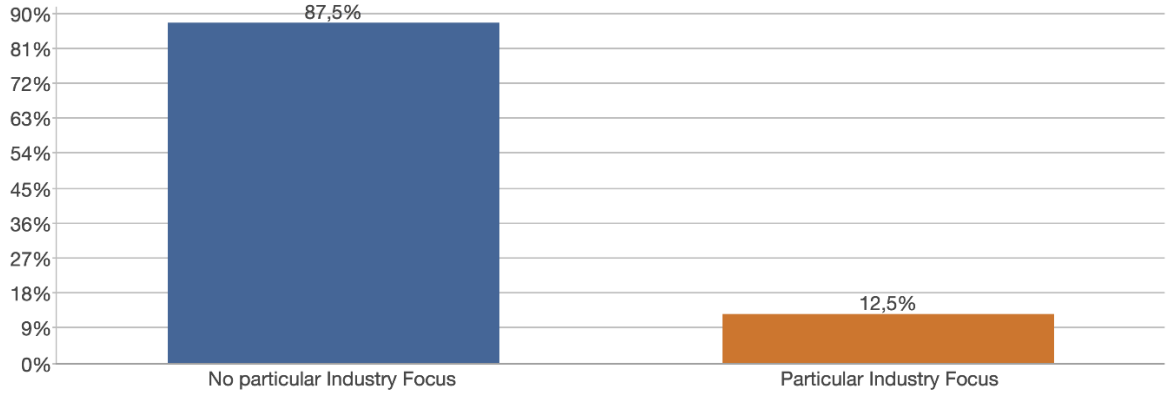

Figure 9. Industry Focus

5.2 Offered Service

This category analyzes the support service of the entrepreneurial institutions at the respective universities and HEIs, focusing on delivering value, knowledge, and expertise to the entrepreneurs and start-ups. Therefore, the main emphasis is placed on intangible goods through interpersonal communication approaches as well as teaching events and specific activities offered by the institution. To guarantee the validity and comprehensibility and to clearly visualize the present data, the following category was divided into general support service offers as well as specific teaching events to separate the academic and educational site from the general support consultation.

Figure 10 illustrates the available teaching events at the respective university or HEI. The results indicate that all universities interviewed (100%) offer entrepreneurial lectures. Most of the respondents underscored the importance of a professional and competent entrepreneurial education to sensitize individuals about the field of entrepreneurship and to increase entrepreneurial motivation on campus. Most experts indicated that the entrepreneurial lectures are offered as elective subjects. Nevertheless, two respondents also stated that the field of entrepreneurship had been integrated into the core curriculum at their universities. Furthermore, most

respondents also mentioned the desire to further develop and extend the existing education programs, mainly cornering entrepreneurship and innovation management.

As Figure 10 illustrates, workshops and open courses are provided at 75% of the interviewees' universities or HEIs. One respondent indicated that most support measures are included in courses and workshops that align with the various development stages of the start-ups. Moreover, during the evaluation process, it became apparent that most respondents believe these workshops and courses are designed to deepen the understanding or deliver knowledge in a specific area of entrepreneurship in a more practical way. Therefore, these workshops are aligned with the needs of the start-ups as well as the practical applications.

Additionally, most of the respondents find business pitch trainings to be important. Therefore, 50% of the interviewees indicated that pitch trainings are offered at their respective institutions. Pitching a new concept, presenting the start-up's business plan, and communicating effectively are all important when searching for suitable investors. In addition to entrepreneurial lectures, workshops, and pitch trainings, some universities and HEIs present seminars (25%) and projects (12.5%) to entrepreneurs and start-ups as well. However, the respondents indicated that most seminars and projects are externally organized. Seminars are conducted mostly by external experts who work or operate in a specific field, for instance, patent law.

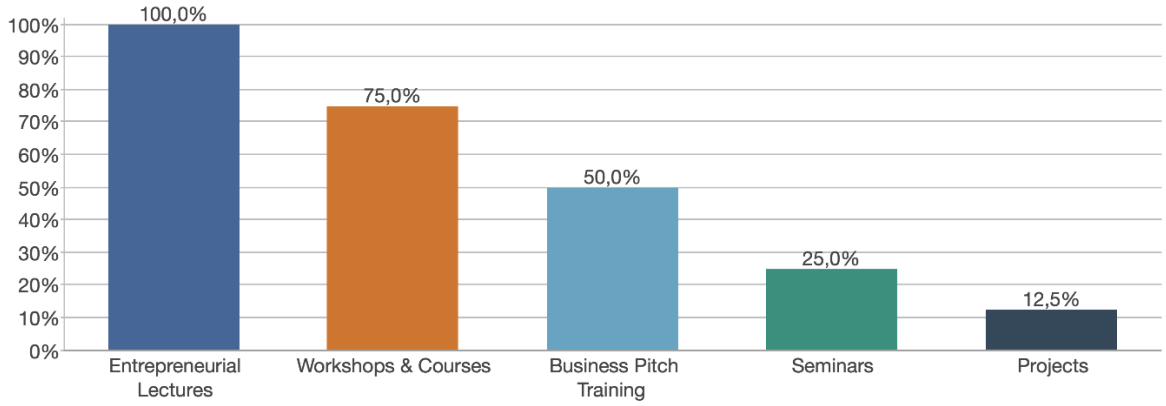

Figure 10. Teaching Events

As Figure 11 demonstrates, expert knowledge not only plays a significant role in relation to seminars and projects, it also represents one of the most common support services offered by the respective entrepreneurial institutions. According to the experts interviewed, 87.5% of all institutions offer professional consultation, primarily in the fields of legal, financial, and tax support. Another important service provided by the entrepreneurial institutions are entrepreneurial events on campus (75.0%). Most of the interviewees mentioned network events, contests, and team events where students of the respective universities and HEIs get together to interact and exchange views and insights.

Support for funding applications, general management support, and general consultation is also provided by the majority of respondents (62.5%). The funding application support comprises mainly the application and proposal for the EXIST funding program of the BMWi. Nevertheless, in general, most respondents mentioned that their institution provides support for any type of funding program and aims to enable start-ups and entrepreneurs to access capital. Management support mainly includes business development strategies, market potential analyses, business relations management, and general start-up and innovation management. Moreover, most interviewees also mentioned the development of market-based business models as well as strategic and financial planning support. The general consultation mainly comprises the initial consultation and individual support measures. This includes an orientation guide, team acquaintance exercises, exploration of the motivation behind the entrepreneurial idea, and answers to open questions posed by the start-ups and entrepreneurs through individual adjustments.

Moreover, 50% of the respondents mentioned coaching activities as well as network opportunities. Most emphasized the importance of a solid network of external experts and companies to open up new and enriching possibilities for start-ups and entrepreneurs. However, relationships with external experts, companies, and institutions are not the only key factors. The network linking the start-ups and entrepreneurs at the respective university or HEI also plays an important role in driving entrepreneurial activities. One interviewee stated that communication among

start-ups and entrepreneurs enables peer learning and thereby plays a decisive role in creating an enriching entrepreneurial culture at a university or HEI. Personal mentoring and co-founder matching are other forms of service mentioned by the interviewees; these programs are offered by 37.5% of the universities and HEIs. Furthermore, one respondent (12.5%) indicated scouting as an effective and efficient service provision.

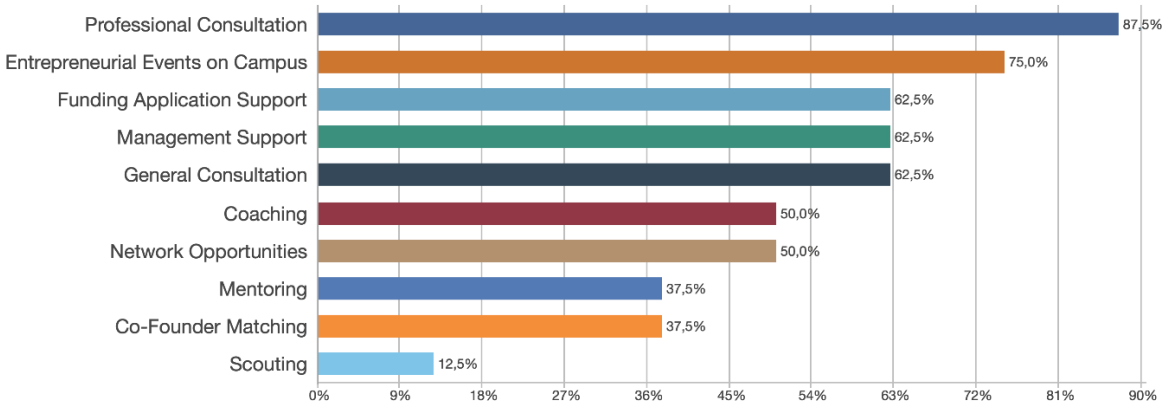

Figure 11. Service

5.3 Equipment

The following category analyzes the available equipment and physical space at the entrepreneurial institutions. Figure 12 provides an overview of the equipment mentioned by the interviewees. Three-quarters of those interviewed (75%) reported that their institution provides office space and suitable premises to start-ups and entrepreneurs, allowing teams to meet, discuss, and work together in one space.

Moreover, 25% of all interviewees offer office supplies such as printers, screens, and flip charts. Specific software applications, for instance, cloud-based tools as well as guiding software solutions, are also available at some entrepreneurial institutions, equating to 25% of all respondents. Moreover, 12.5% of the respondents particularly mentioned 3D printers, coworking spaces, and a design lab.

Nevertheless, most respondents indicated that besides the available equipment on-site, most of the prototype tools such as 3D printers or other equipment needed by

a start-up are available at regional facilities that have strong collaborations with the respective university or HEI.

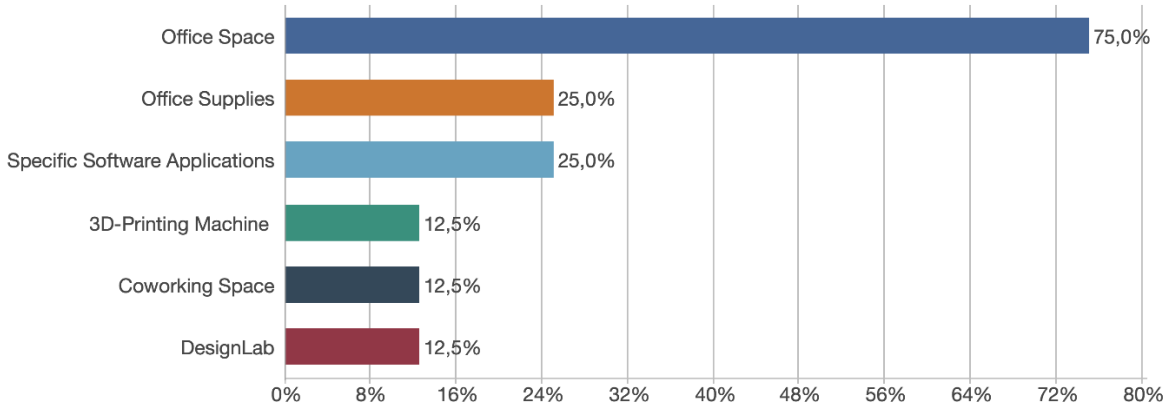

Figure 12. Equipment

5.4 Organizational Elements

In the following, the main organizational elements of the entrepreneurial institution are evaluated. The aim is to present the prominent characteristics of the operational and organizational structures, with the focus on characteristics that influence institutional tasks, activities, and operations. Consequently, this category comprises five subcategories, namely, organizational identification, financial structure, collaborations, employees, and the average number of start-ups supervised.

Organizational identification refers to the term that the entrepreneurial institution uses to identify itself. As Figure 13 illustrates, the largest number of institutions describe themselves as an incubator (37.5%). These respondents indicated that their institutions focus mainly on inducing new start-up formations from the outset with the goal of creating solid business models. Therefore, these institutions support start-ups from the beginning, mostly starting with the conceptual development and continuing with the implementation process. In comparison, the expert whose institution identifies itself as an accelerator (12.5%) said its focus is on development of the initial business plan, assessment of the market and investment readiness, and introduction to potential companies. As a result, the respondent emphasized that the

institution supports start-ups and entrepreneurs that are further along with their business models and do not require the ideation phase.

One-quarter (25%) of all respondents identify their institutions as centers for entrepreneurship and innovation. One respondent (12.5%) associated the institution with a start-up consultancy and one interviewee (12.5%) declined to select any term. Conspicuously, these four respondents share the same viewpoint, saying the definition is relatively insignificant, and therefore they prefer an uncomplicated and innocuous term to avoid any confusion. Moreover, some respondents also indicated the missing accuracy and precision concerning these terms and mentioned an expansive interpretation scope that often leads to false assessments.

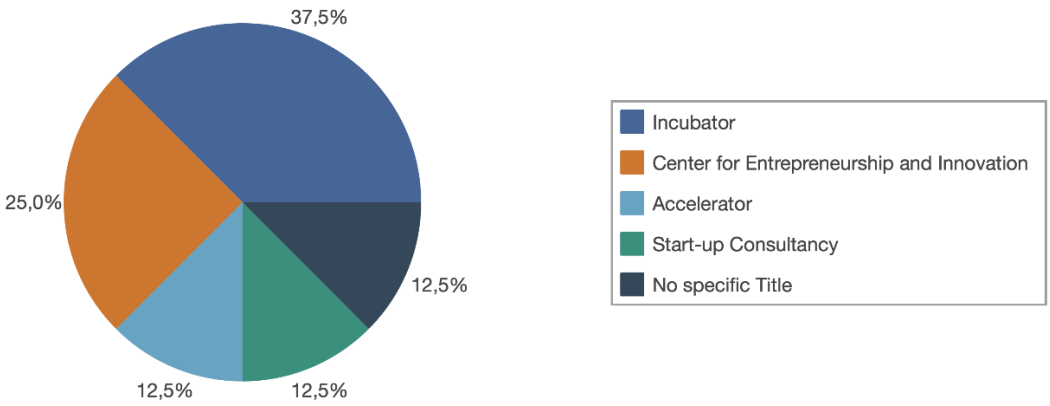

Figure 13. Organizational Identification

Another factor influencing the organizational structure is joint collaborations between external academic and municipal institutions. After analyzing the relevant textual content, it became apparent that all interviewees (100%) mentioned collaborations, especially with other regional universities or HEIs. Moreover, 25% of the respondents also highlighted cooperation with international universities, mainly in the Netherlands. Nevertheless, it is not only universities and HEIs that express a willingness to cooperate. Three-quarters (75%) of all respondents mentioned cooperation with regional municipal corporations, especially local entrepreneurial hubs. Most of the respondents underscored the advantageous effect of collaborations with municipal corporations as they provide attractive opportunities

for start-ups and entrepreneurs, especially concerning technical equipment and physical space. Moreover, one interviewee (12.5%) mentioned a collaboration with an international municipal corporation (Figure 14).

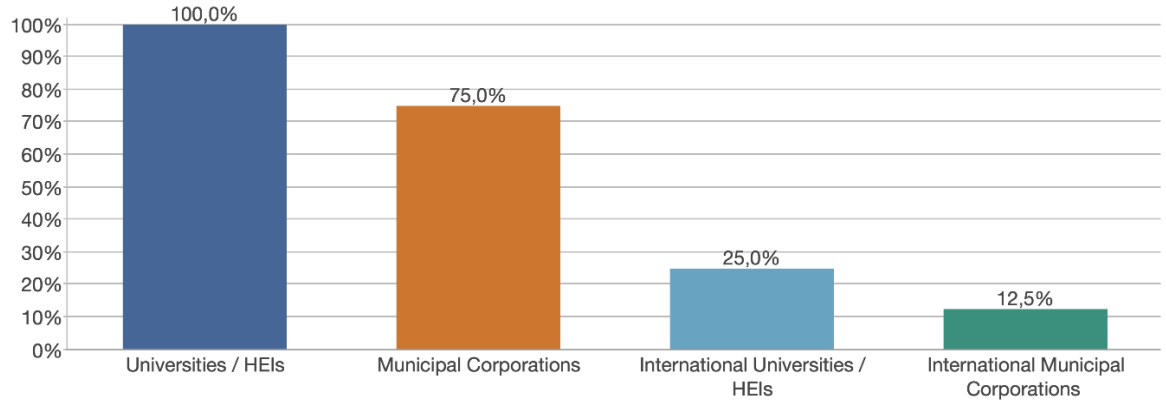

Figure 14. Collaborations

Another important factor concerning the organizational and operational structure of an institution concerns the financial structure. Therefore, the interviewees were asked how their respective institutions are organized in terms of financial support structures as well as funding sources (Figure 15).

When the participants were asked how their entrepreneurial institutions are financed, the majority commented that most funding comes from state programs (75%). Moreover, 50% mentioned the university budget as another form of financing. Furthermore, after analyzing the financial structure of the respective facilities, it became apparent that most universities or HEIs feature a combination of financial instruments, with most respondents indicating a combination of state and university funding.

Federal funding programs as well as project-based funding were reported by 25% of all respondents. Additionally, one respondent mentioned sponsorship (12.5%) as a source of financing, and another respondent declared that the institution is self-financed (12.5%).

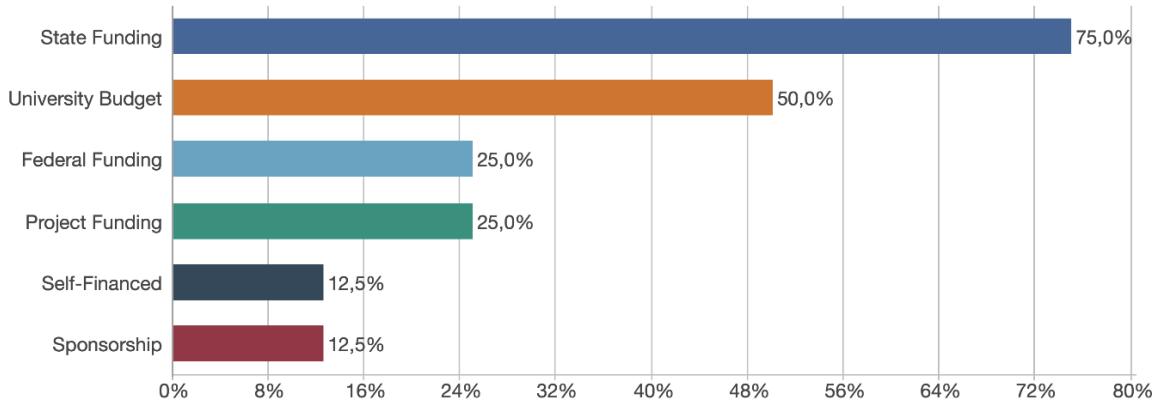

Figure 15. Financial Structure

The number of employees working in the consultancy service of the entrepreneurial institution represents another subcategory. Figure 16 illustrates the number of full-time employees actively supporting or coaching start-ups and entrepreneurs at the respective institutions. Only employees working in the consultation field were analyzed.

As Figure 16 indicates, most institutions employ fewer than five coaches or counselors (50%). Moreover, 25% of the respondents indicated that between 15 and 20 employees had been recruited at the entrepreneurial institution, and one respondent declared that between 10 and 15 people are employed as coaches or counselors (12.5%) Furthermore, one interviewee indicated that five to 10 people (12.5%) work in the consultancy at the institution.

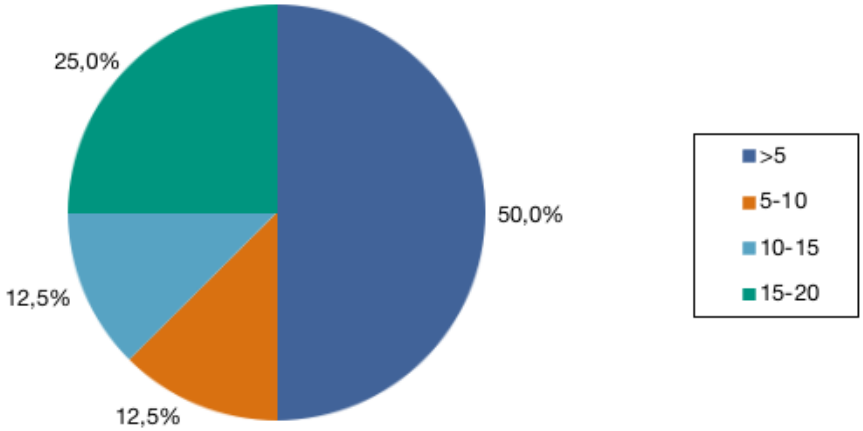

Figure 16. Employees - Consultancy Service

Figure 17 demonstrates the final subcategory and indicates the average number of start-up projects as well as start-ups that had been supervised at the entrepreneurial institution. The respondents who positioned the number of start-ups from 10 to 20 (12.5%), 30 to 40 (25%), and 50 to 60 (12.5%) emphasized that the number represents a yearly average of supported start-up projects. The respondents who indicated the number of start-up projects above 100 clearly mentioned that they comprise mostly the initial consultations of the start-ups at the respective entrepreneurial institutions (37.5%). Furthermore, one respondent left the question open, as the entrepreneurial institution is still in the planning and opening phase, and therefore does not yet have any data on the average number of start-ups being supervised (N/A).

Nevertheless, it is important to highlight that the data presented in Figure 17 cannot be interpreted as concrete numbers of start-up projects at the respective institutions. Some interviewees also mentioned the complexity of devising an average number of start-up projects. This is mainly because the start-ups are situated in different stages as well as phases. The interviewees stated that it is easy to lose a clear overview of the total number of start-ups, especially if no one is responsible to precisely track this specific number. Moreover, the respondents mentioned that a significant difference exist between the numbers of initial consultations, start-up projects that are part of the support program, and start-ups that position themselves for the market.

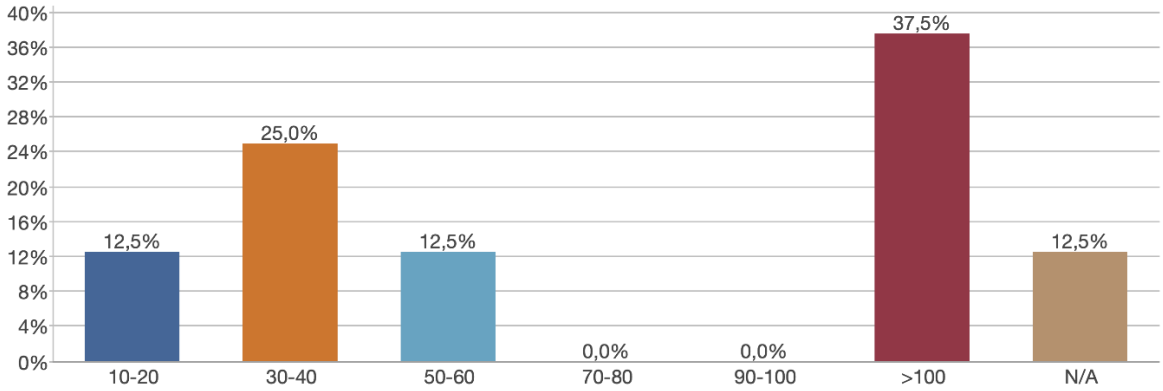

Figure 17. Start-up Projects

5.5 Entrepreneurial Motivation

This chapter analyzes the entrepreneurial motivation on campus. Therefore, Figure 18 indicates the individual assessment of motivational factors derived from academic lectures and entrepreneurial events at the respective universities or HEIs. As the Figure illustrates, 50% of all respondents mentioned academic lectures as one of the most important sources of entrepreneurial motivation. Most respondents indicated that students become aware of the field of entrepreneurship and entrepreneurial possibilities at an early stage through academic lectures.

As a result, the interviewees emphasized the importance of entrepreneurial education to inspire students and to enhance enthusiasm regarding entrepreneurship. Nevertheless, most respondents also clarified that the structure of the lectures is key to their influence, with those that are more practically oriented considered more advantageous in motivating entrepreneurship.

Furthermore, 25% of all respondents indicated that entrepreneurial events are the main driving force of entrepreneurial motivation on campus. The respondents stated that these events motivate students as people come together, communicate, and share experiences and knowledge. These events can link future entrepreneurs and start-up creators with the founders of more highly developed start-ups, which simultaneously enables the exchange of knowledge and experience. Additionally, these events also create networking opportunities with prospective clients, investors, and potential stakeholders.

However, two respondents stated that a mixture of both campus lectures and events enables entrepreneurial motivation (25%). The respondents highlighted the importance of entrepreneurial education to provide a solid academic foundation, adding that they believe entrepreneurial events alone are insufficient. Therefore, it is important to establish an academic foundation in combination with entrepreneurial events.

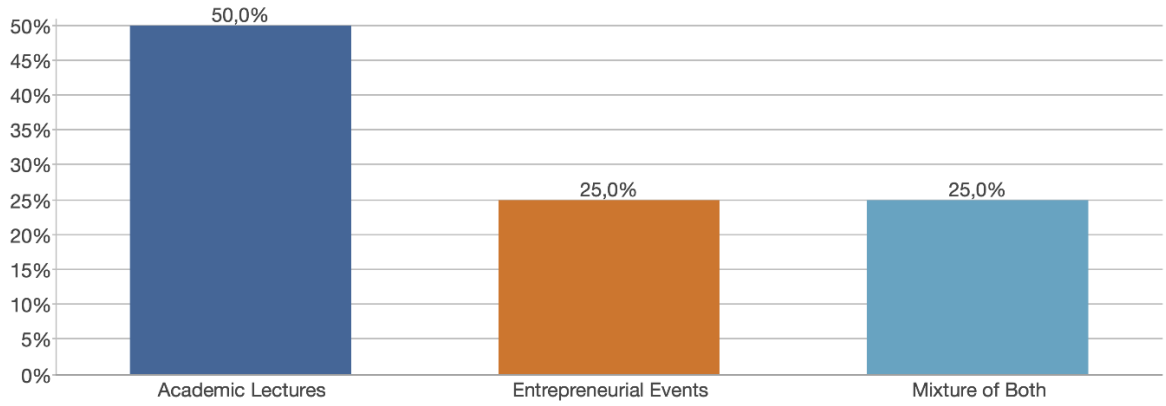

Figure 18. Entrepreneurial Motivation

5.6 Uniqueness and Critical Success Factors

Two other important factors subjected to analysis are the success factors and the uniqueness attributed to the respective universities or HEIs. This category evaluates key factors named by the respondents as driving the success and determining the uniqueness of the respective facilities. During the evaluation process, it became apparent that uniqueness and success factors are highly diverse among the entrepreneurial institutions. Nevertheless, some factors were mentioned by several interviewees.

As Figure 19 illustrates, one important factor is the labor force at the institution. The interviewees indicated the advantageous impact when former entrepreneurs work at the entrepreneurial institution (37.5%). The interviewees stated that employees who had been entrepreneurs themselves deeply understand the start-ups' needs and challenges because of personal experience and acquired knowledge. Hence, the respondents stated that young entrepreneurs feel more secure and better understood. Nevertheless, one respondent also mentioned the benefit of employees who came from industry, as they have a broad understanding of market structures, possess solid knowledge, and deliver market expertise (12.5%).

Peer learning is another success factor mentioned by 25% of all respondents. The respondents indicated the value of entrepreneurs learning from each other, which in

turn increases the success of their start-ups as well as the success of the institution. Other factors mentioned by the interviewees include the internal operational process, namely, freedom to act (25%); university commitment (12.5%); lean management (12.5%); and short decision paths (12.5%). The respondents stated that an institution benefits significantly from a flat organizational structure, as decision paths are shorter, enabling faster implementation processes and a greater scope of action. A strong network represents another success factor mentioned by the respondents (25%). The interviewees indicated that a strong and broad network of external experts as well as collaborations with other entrepreneurial institutions are significant contributors to success, as start-ups and entrepreneurs obtain expert assistance as well as competent support. Other success factors involve the program structure of the respective facility as well as the provided equipment or service, namely, office space (12.5%); flexible program design (12.5%); investor relations (12.5%); and structured consultation processes (12.5%).

A high level of intrinsic motivation of the staff member (12.5%), a prime location (12.5%), the specific sector in which the institution operates (12.5%), and the interpersonal relationships with start-ups (12.5%) were also perceived as critical success factors. Moreover, regional economic support (12.5%) as well as the contribution to the regional ecosystem (12.5%) were mentioned by interviewees. Regional economic support was considered a key contributor to the institution's success as it enables new possibilities and further opportunities for start-ups as well as entrepreneurs at the university or HEI.

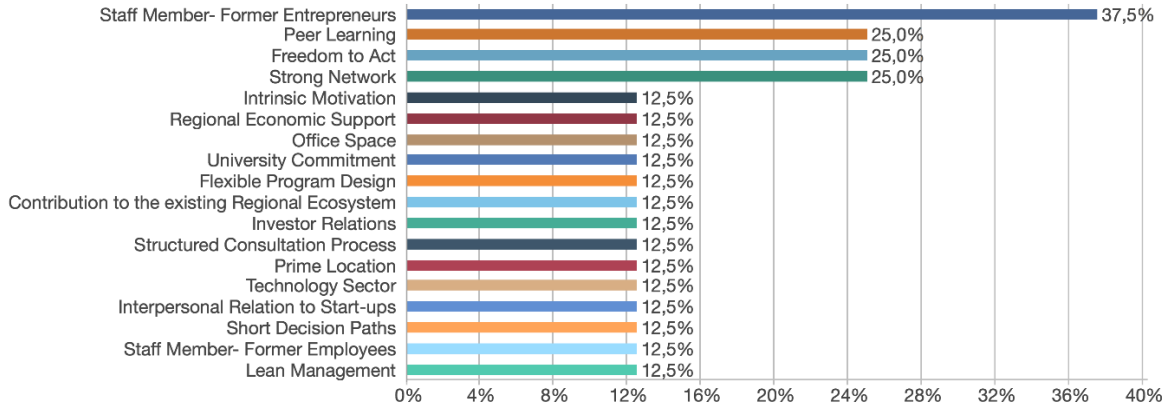

Figure 19. Uniqueness and Critical Success Factors

5.7 Start-up Trends

Start-up trends represent another category for examination, particularly the main thematic fields that influence entrepreneurial ideas and induce the formation of new start-ups.

As Figure 20 indicates, there is a clear trend toward digital transformations. As a result, 50% of all respondents mentioned the field of digitization as one of the most significant trends as well as the primary influencing factor concerning start-up activities and new formations. Topics such as AI (50%), blockchain (12.5%), digital health care (12.5%), IT security (12.5%), and other topics summarized by one respondent under the term “industry 4.0” (12.5%) represent the main thematic areas in which start-ups operate at the respective entrepreneurial institutions. Even though a majority of the interviewees mentioned a clear trend toward digital transformation, it is apparent that the thematic fields mostly complement the main academic fields of the respective universities or HEIs.

Nevertheless, topics such as mobility (25%), sustainability (12.5%), food (12.5%), and social innovation (12.5%) were also considered as influential areas by the respondents.

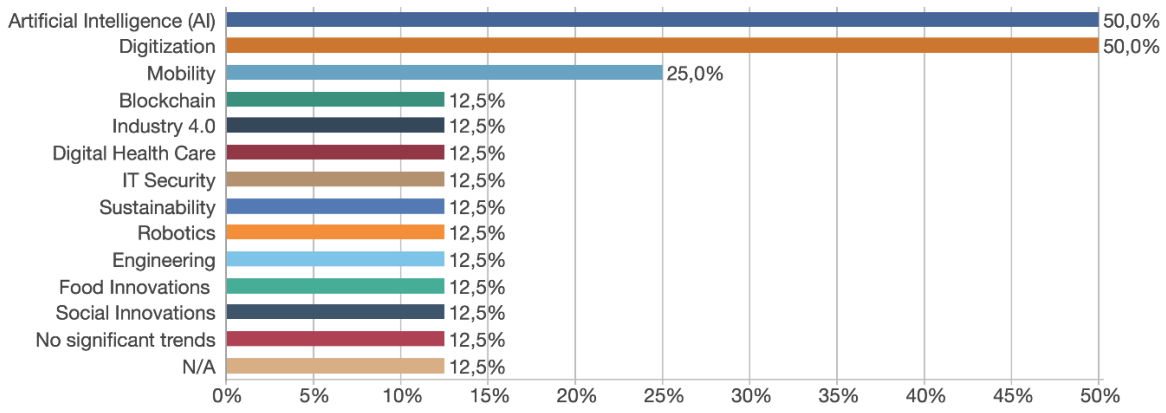

Figure 20. Start-up Trends

5.8 Characteristics of an Incubator at Universities and HEIs

Many terms can be applied to describe support programs and services for start-ups and entrepreneurs. The term incubator as it relates to universities and HEIs was a focus of particular study.

After evaluating the relevant textual components, it became apparent that 50% of all interviewees see an incubator as a foundational preparation process (see Figure 21). For this reason, respondents indicated that the main objective behind an incubator is to successfully guide start-ups from initial idea to establishment of a solid business model and continuing to the official founding.

One respondent indicated that the entrepreneurs who seek an incubator's support are still in the ideation process (12.5%), so the initiation phase represents the incubator's paramount objective. Moreover, one interviewee characterized an incubator as a space for growth (12.5%).

The interviewees also stated that an incubator at a university or HEI should be able to provide all necessary support to ensure the evolution of the start-up. Several interviewees highlighted support measures as characteristics of a successful incubator, including a structured program (25%), strategic management (12.5%), operational and administrative assistance (12.5%), and personal and professional consultation (12.5%). The interviewees stated that personal and professional counseling are important to empower entrepreneurs.

Moreover, business relationship management (25%) was also mentioned as an important characteristic of an incubator at an entrepreneurial institution, since it is critical to create an interface between the institution and the industry as well as other external parties who drive start-up activities. Another characteristic mentioned by one respondent is the relationship to the start-ups at the institution (12.5%). The interviewee indicated that start-ups that are supported by an incubator depend on the service and support of the respective entrepreneurial institution.

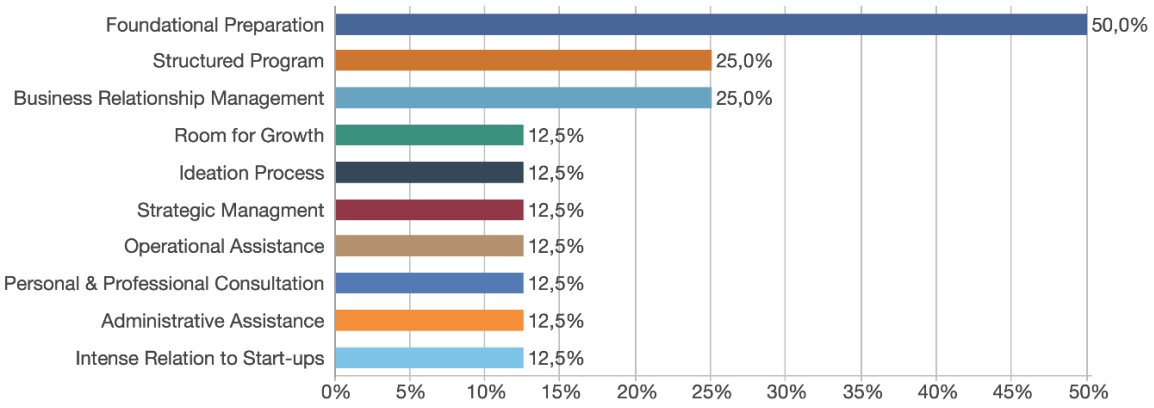

Figure 21. Characteristics of an Incubator at Universities and HEIs

5.9 Perception of the German Start-up Ecosystem

The last category comprises personal viewpoints concerning the overall German start-up ecosystem. Positive and negative aspects of the German ecosystem as perceived by the respondents were analyzed. Figure 22 demonstrates that the majority of all respondents evaluated the German start-up ecosystem as positive (75%), pointing to the support environment and subsidy programs as making useful contributions.

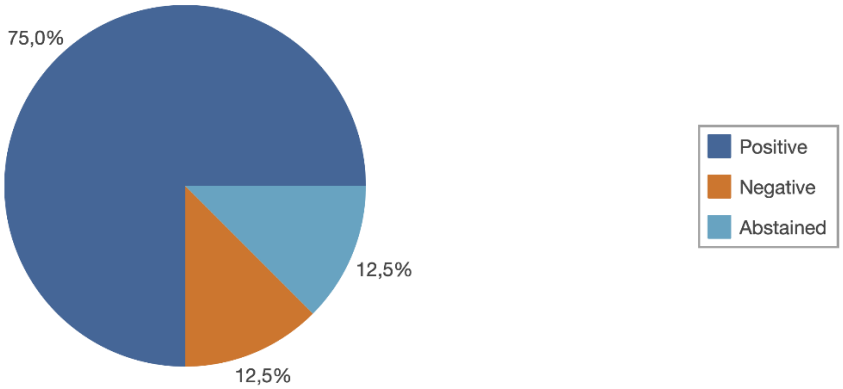

Figure 22. Perception of the German Start-up Ecosystem

Another positive factor mentioned is rising institutional and corporate involvement in entrepreneurial activities. Moreover, sustainable investment structures and the resulting sustainable development of start-ups were also perceived as positive

features of the German start-up ecosystem. However, 12.5% of respondents rated the overall German ecosystem as negative, and 12.5% abstained.

Besides the positive aspects concerning the German start-up ecosystem, the respondents also mentioned several issues in need of improvement. As indicated in Figure 23, a majority of all respondents indicated that the German culture and overall mentality adversely affect the German start-up ecosystem (62.5%). Several interviewees mentioned a change in mindset, especially concerning high risk aversion. The career path of an entrepreneur is considered high-risk compared to the path faced by people in classic employment relationships. However, the interviewees indicated that entrepreneurship should be considered a more natural and self-evident path to employment.

Additionally, several interviewees perceive the current number of employment opportunities in Germany as detrimental to the German start-up ecosystem (25%). Because of solid and stable employment structures and numerous employment opportunities, most graduates take the safe path and choose classic employment. Another factor mentioned by the respondents is the tendency to compare the German ecosystem with other international ecosystems or specific regional ecosystems in Germany. From a regional viewpoint, every ecosystem possesses different strengthens and weaknesses that need to be regionally deployed and compensated for. Even though most of the respondents stated that Germany should think on a larger scale and in larger dimensions, the comparison with other countries such as the United States seems unrealistic to the respondents, especially due to social-cultural differences.

Besides the German culture, a majority of the respondents also mentioned the propensity for investment, or lack thereof, as detrimental to the German start-up ecosystem. Half (50%) of the interviewees indicated that German start-ups continue to face enormous financing challenges. Most of the respondents particularly highlighted the difficulty of accessing venture capital, especially for start-ups that are more fully developed and need higher investments. Several respondents mentioned that many subsidy programs successfully support start-ups in their initial phase, but

the main difficulty is a low confidence in investments, particularly concerning those on a large scale.

Another important factor is the direct link between science and the economy (25%) to enhance the overall entrepreneurial potential. Connecting science and business enables innovative concepts and drives the overall potential for innovation, especially for small- and medium-sized companies. Moreover, by creating an interface between academia and industry and by enhancing the overall knowledge transfer infrastructure, entrepreneurs are able to supply the needs of the market through the transfer of specific research assignments and the creation of spillover effects. Furthermore, administrative effort (12.5%), the continuance of the facility (12.5%), and the massive number of support measures (12.5%) provided to the start-ups were also mentioned by the respondents as detrimental to the German ecosystem.

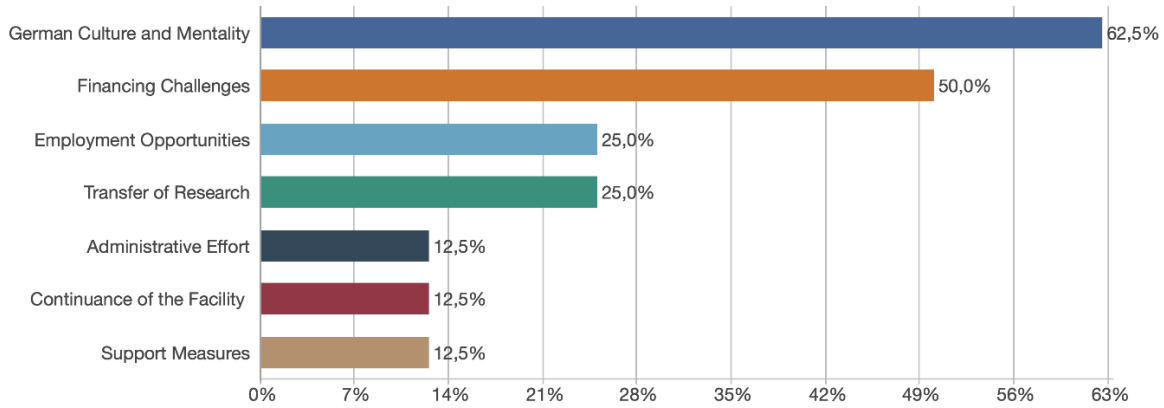

Figure 23. German Start-up Ecosystem - Negative Aspects

6. Results and Discussion

The purpose of this research study is to analyze organizational elements and support structures of various entrepreneurial institutions at German universities and to investigate the main factors contributing to the overall success of these institutions. To fulfill the purpose of this paper, a total of eight expert interviews were conducted. In the following, the aggregated results are presented and discussed.

The ever-growing support environment in Germany has empowered many individuals to become successful entrepreneurs, and a variety of programs and facilities have been established to meet the rising demand. However, due to the vast numbers of support approaches, the distinction among these offers has become unclear. The study by the institution of innovation and technology revealed that the many choices for entrepreneurial support lead to confusion and complicate the selection of an appropriate support approach by start-ups and entrepreneurs (Zinke et al. 2018, p. 156).

The results of the institution of innovation and technology's study concerning the disparity among support measures (Zinke et al. 2018) are consistent with the present research findings. After gathering and evaluating the data set, it became apparent that most interviewees confirm the ambiguity concerning specific terms such as makerspace, incubator, and accelerator. When asked how the universities would identify the respective entrepreneurial institution, one interviewee stated:

> *"Generally speaking, as a center. It is the most non-committal form. For instance, entrepreneurship center. With this you can be everything or nothing, and that is exactly the reason why." (I1, Pos. 159)*

Therefore, experts are cautious about using different terms and assigning clear identifications to the respective facilities. Nevertheless, some experts precisely distinguished between different support approaches and clearly identified the entrepreneurial institution as an incubator or an accelerator. The results demonstrate that the term incubator is mostly used in conjunction with early-stage start-ups. It became apparent that an incubator's main objective is to successfully guide a start-

up from the initial idea to the establishment of a solid business model right up to the official founding process. One interviewee defined an incubator as follows:

> *"An incubator represents a 'breeding place' for start-ups with a small idea. We want to transfer and develop the initial idea into a solid business model comprising, for instance, a strategic business plan. That is what we understand under the term incubator." (I6, Pos. 116)*

The results reflect the respondents' understanding of an incubator, especially at universities and HEIs, and demonstrated that more than half portray an incubator as a preparation for the foundation of a start-up. Furthermore, a parallel can be drawn to the provided theoretical framework.[1] After gathering and evaluating the data, it became apparent that the interviewees who identified the facility as an incubator also indicated that the institution has free admission, imposes no specific time limits, and does not request a comprehensive application from the entrepreneurs. Moreover, the time span of start-ups on-site is difficult to evaluate and depends on several factors. As a result, the average time spent on-site cannot be tracked linearly.

Whereas incubator programs tend to focus on start-ups in the ideation phase, an accelerator program is portrayed as a support environment for more advanced start-up teams and entrepreneurs. The results demonstrated that an entrepreneurial institution that is identified as an accelerator concentrates on the further development of start-ups, as one interviewee described:

> *"I mean, if you want to distinguish between incubator and accelerator, then I guess an incubator is the place where people are coming almost pre-idea [...]. An accelerator is more of a place where the team is formed, the idea is clarified, and you are much more ready to go to market and for entering investment. And so, we are definitely an accelerator and not an incubator." (I3, Pos. 50)*

[1] Referring to the research paper of Nesta, a British innovation foundation that defined an incubator according to specific attributes (see subchapter 2.4.1) (Bone et al. 2017)

The main differences between an accelerator and an incubator are not simply related to the different development stages of the start-ups. The data revealed that an accelerator program includes a comprehensive application process, impose a specific time limit, and restricts the number of start-ups that are being supported. Therefore, from the research that has been conducted, it is possible to conclude that an accelerator program is more linearly structured than an incubation approach.

After analysis of the data, it also became apparent that terms such as makerspaces or fab labs were not mentioned in conjunction with the identification question. Rather, these terms were introduced in connection with collaborations, especially with regional municipal corporations. Some interviewees indicated that they are planning to build a makerspace. Nevertheless, it had been introduced in the form of an open workplace rather than a support approach or program. Therefore, based on the research results, it is possible to conclude that incubators and accelerators are often perceived as programs or support procedures, and makerspaces, fab labs, and coworking spaces are likely to be perceived as workplaces and facilities that provide physical goods such as machinery, technology, and space.

Besides the organizational identification and personal comprehension of different terms, another important factor was analyzed, namely, the critical success factors at the respective entrepreneurial institutions as well as the overall perception of a successful incubator concept at universities and HEIs.

In conjunction with the incubation concept at universities and HEIs, it became apparent that a critical success factor comprises the structure of the program as well as the service being offered to the start-ups. The interviewees mentioned that a considerable network is of high relevance and contributes to the success of an incubator concept. Accordingly, collaborations with various universities, entrepreneurial facilities, or the industry is important to guarantee that start-ups receive precisely the service they need. Furthermore, external professionals and specialists were also mentioned as success factors, especially concerning legal affairs, financial issues, and tax issues. Moreover, parallels can be drawn between the success factors mentioned in connection with a general incubation concept and

the success factors and unique features mentioned by the interviewees contributing to the overall success of the respective facility. For instance, one interviewee indicated that:

> *"It is also important who works at the incubator. Personally, I would say it's recommendable to have external people working in an incubator, not only people from the university to enable the transfer with the economy at an early stage, to possess a considerable network [...], in my opinion, that is what makes it successful [...]." (I5, Pos. 39)*

The data obtained indicates that the staff members at a university or HEI entrepreneurial institution are of significant relevance and contribute to the institution's overall success. The pertinence of the employees is also an important success factor mentioned by the respondents. An entrepreneurial institution benefits greatly when former entrepreneurs work as coaches or counselors. Former entrepreneurs can draw on personal experience to understand the needs and problems of start-ups. Therefore, the ability of former entrepreneurs to empathize and engage with start-up teams increases the appropriateness of the support they provide. Furthermore, interpersonal relationships between staff members and entrepreneurs are critical to an institution's success. Based on the research outcome, it is possible to conclude that especially strong interpersonal skills, the ability to communicate effectively, to listen carefully, and to motivate and encourage the start-ups are of central importance to the success of an institution.

After evaluating the data, it also became apparent that most success factors are associated with organizational concerns. The data demonstrated that organizational flexibility, university commitment, and the freedom to develop and implement new ideas simplify and reinforce organizational and performance capabilities. From a financial standpoint, university commitment also plays a critical role. The data demonstrate that most entrepreneurial institutions are financed through the university budget as well as state funds, with contributions also coming from federal funding programs. Some state funds are provided by means of a competition. Nevertheless, after gathering and evaluating the data, it became obvious that some

entrepreneurial institutions receive project-based funds over a certain time interval. Additionally, regional economic support, either financially or in general, is important to an institution's success. Therefore, both internal and external commitment and support are required to maintain a successful entrepreneurial institution at a university or HEI.

Other factors influencing the performance of an entrepreneurial institution are the activities that enhance entrepreneurial motivation on campus. The research results demonstrate the particular importance of entrepreneurial education. All institutional experts interviewed emphasized the importance of education to motivate students from the start. After evaluating the data, it also became apparent that all universities supplemented courses with other teaching events, particularly covering entrepreneurial matters. The availability of the courses and lectures vary in amount and extent.

In 2018, the German Start-up Monitor indicated the importance of entrepreneurial education, revealing that entrepreneurs desire continuous enhancement of their education at universities or HEIs (Kollmann et al. 2018, p. 91). Based on the research results of the present study, it is possible to conclude that universities and HEIs are aware of the importance of entrepreneurial education. Nevertheless, an important implication of these findings is that entrepreneurial education is crucial to entrepreneurial motivation and awareness on campus. Therefore, entrepreneurial education represents an indispensable component at universities or HEIs and must be developed further. Other factors increasing awareness of entrepreneurship are networking events on campus contributing to a dynamic entrepreneurial culture. However, the data indicate that these events alone do not represent a satisfactory solution. Therefore, it is important to balance a dynamic entrepreneurial culture and the entrepreneurial education provided to students. Most entrepreneurial activities on campus revolve around the current megatrends such as AI, robotics, or smart mobility. Moreover, social innovations as well as topics regarding sustainability are also in great demand.

Overall, even though the German start-up ecosystem received a relatively positive assessment, it became apparent that, besides financial challenges, the transfer of knowledge between science and industry holds great potential for improvement. This is of vital importance as knowledge transfer enhances the potential for innovation. Accordingly, start-ups would be able to satisfy the needs of the market more precisely. An innovation system, such as the NIS approach, thrives on the interconnection between private and public institutions. Besides financing challenges or the German mentality, the transfer mechanism between different organizational institutions represents an indispensable condition in a successful innovation system. Therefore, the interchange between universities and the corporate world must be intensified.

7. Summary

The present research work provides an overview of the current start-up ecosystem at German university and HEIs. The purpose of this research study is to examine relevant organizational elements and to analyze potential structures as well as specific particularities concerning the various offerings of different entrepreneurial institutions. The primary objective is the identification of critical success factors of the respective entrepreneurial universities as well as the motivational factors concerning entrepreneurial activities. Moreover, the present research study aims to find tangible factors distinguishing various support approaches.

Referring to the purpose of the research, a qualitative research approach was selected to gather new insights and perspectives on the research topic. Therefore, a total of eight expert interviews were conducted to obtain in-depth knowledge of the overall support environment at German universities and HEIs. Before conducting the interviews, significant literature research was conducted to establish a comprehensive theoretical background and to acquire knowledge vital for the development of an appropriate interview guide. After gathering the data, the evaluation process was derived according to the procedure of a qualitative content analysis by Philipp Mayring (Mayring 2015).

An increasing amount of literature is focused on the importance of innovation systems. The interaction between various organizational institutions enhances the overall potential for innovation regionally as well as nationally. Today, universities and HEIs play a crucial role in the system of innovation and have evolved as active and highly relevant participants in the innovation system. Various support measures have been established to enhance the culture of innovation at universities and to drive entrepreneurial activities, such as incubators, accelerator programs, makerspaces, and fab labs. These entrepreneurial facilities strive to support and encourage start-ups to develop innovative ideas into solid business models. Moreover, entrepreneurial education has also gained a growing importance in the economy as it enhances the transfer of knowledge and technology between science

and industry. Nevertheless, because of the great variety of programs and support structures, the distinctions between them have become unclear. The results of the present research study also confirm the difficulty in identifying clear distinctions between different terms. The results reveal a tendency toward a cautious use of specific terms referring to the entrepreneurial institutions.

However, the research demonstrates a propensity toward the use of an incubator approach, which is perceived as supporting start-ups from the beginning. By contrast, an accelerator is perceived as supporting a start-up at more highly developed start-up stage. The data reveal that an incubator has fewer entry requirements than an accelerator program, and an accelerator program is more linearly structured than an incubator. Additionally, terms such as makerspaces or coworking spaces are associated with workplaces that mainly provide physical goods, such as specific materials, technologies, and machines.

After evaluating the distinctions between terms and organizational elements, the provided services and equipment were analyzed. It became apparent that the offers vary among the entrepreneurial institutions. However, the results indicate that general and professional consultation is mostly offered by the institutions, and that most focus on management support and provide network opportunities. Additionally, most institutions offer office space, but technologies such as 3D printers are predominantly provided through external parties. From a financial viewpoint, almost all institutions are financially supported by their universities or by state funds. Moreover, most entrepreneurial institutions share connections with other universities, municipal corporations, and external experts. Questions regarding legal affairs, financial and tax issues, and patent regulations are mostly directed to specialists. Entrepreneurial events as well as a variety of educational events, such as workshops, seminars, or specific trainings are also offered to students.

After evaluating the crucial success factors as well as the unique features contributing to the overall success of the respective entrepreneurial institutions, it became apparent that connections between external and internal environments are of vital importance. External experts are important to guarantee adequate services

as well as to provide necessary equipment that is not available on-site. Therefore, it is important to gain the financial and organizational commitment of the university. Furthermore, the research results indicate that former employees working as coaches or counselors contribute significantly to the success of an entrepreneurial institution. Former entrepreneurs deeply understand the needs and concerns of future entrepreneurs, and therefore strengthen the interpersonal relationships between the coaches and the start-up business.

Entrepreneurial education also plays a decisive role, especially in regard to the overall entrepreneurial motivation on campus. Based on the research results, it became apparent that entrepreneurial education is important to inspire students and to provide an academic basis that, in turn, increases the entrepreneurial motivation on campus. Nevertheless, besides an academic foundation, entrepreneurial events also contribute to the overall entrepreneurial motivation on campus. Concerning the start-up trends on campus, it became apparent that most entrepreneurial ideas revolve around the megatrends such as AI or mobility.

Overall, the German start-up ecosystem received a positive assessment from the interviewed experts. Nevertheless, financing challenges as well as pathways to transfer technology from academia to industry should be addressed.

8. Limitations

Apart from the research findings, the present research study also includes several limitations that must be specified to provide a complete view of the research work.

The main limitation of this research study represents the relatively small sample size. A larger sample size strengthens the research findings and provides a more precise picture resulting in more valid research outcomes. Because this research compares different approaches, structures, and support measures, a larger data set could identify more differences and similarities of the respective entrepreneurial institutions. Moreover, the sample size of the present research work represents only a small share of the overall start-up ecosystem in Germany and does not provide an overall picture of the support environment at German universities or HEIs. Therefore, by increasing the sample size and by gathering more data concerning the entrepreneurial support environment, a more holistic assessment could be provided.

Another limitation that could have affected the research findings is a sampling bias in the selection of the interviewees. The present research study aims to concentrate on the entrepreneurial universities that are the main innovation drivers in Germany. Therefore, the study of the German Start-up Monitor was used as a foundation to identify successful entrepreneurial institutions. However, to determine successful institutions, more data must be available to obtain a broader picture of the overall ecosystem in Germany.

Besides the selection of the interviewees, other limitations involve the expert interviews themselves. Biases can emerge during interviews, affecting the interviewee as well as the interviewer. For instance, one limitation is the possible time constraints affecting the interviewees. This influences the scope and detail of their statements, which in turn decreases the significance of the data.

Moreover, different interview styles were used, which might influence the research outcomes. Most of the interviewees were conducted by telephone due to geographical distances. As a result, specific facial expressions could not be evaluated. To obtain a better overview and understanding of the entrepreneurial

environment at the respective universities and HEIs, face-to-face interviews on-site could have increased the significance of the research results.

Another limitation is the time period of this research study, which presents only a snapshot of the current entrepreneurial support environment in Germany. The German start-up ecosystem is constantly growing and is a highly dynamic ecosystem. Therefore, the present research study provides only a temporary picture of the respective entrepreneurial institutions.

9. Conclusion

The aim of the present research was to analyze the support environment for entrepreneurial activities at German universities and HEIs. The main focus was on supportive measures and organizational elements offered by the institutions. Additionally, factors that contribute to the overall success of such entrepreneurial institutions as well as the entrepreneurial motivation on campus were examined. The present study also was designed to identify clear distinctions between different terms to contribute to the overall understanding of the different support measures.

Based on the research results, it can be concluded that the present research study contributes to a better comprehension of structural and operational factors that influence the performance of entrepreneurial institutions. Therefore, from the research that has been conducted, it is possible to conclude that different entrepreneurial institutions possess different operational structures and offer different service measures. It became apparent that counseling and consulting services are in high demand and are offered by all entrepreneurial institutions considered in the study. The research findings also revealed that professional consultation by external experts is of vital importance, especially concerning legal affairs, patent regulations, and tax issues. Moreover, this study determined that collaborations between universities and regional municipal corporations significantly contribute to the variety of services and equipment offered.

Other significant findings to emerge from this research study concern the key success factors of the respective entrepreneurial institutions. Based on the research results, it is possible to conclude that the engagement of the respective university especially contributes to the overall success. Besides the financial support, a flat organizational structure with decentralized decision-making processes and a greater scope of actions enhance operational efficiency by simplifying the communication structures. Therefore, entrepreneurial institutions gain the ability to expedite decision-making and are able to make faster adjustments, which is especially important when operating in such a dynamic environment. Furthermore, the present

research revealed the significance of interpersonal relations in an entrepreneurial environment. Moreover, the research findings indicated that employees who had been entrepreneurs themselves contribute significantly to an institution's success. Former entrepreneurs have the ability to empathize, motivate, and understand the common needs and doubts of future entrepreneurs. Taken together, the research results indicate the importance that connections between external and internal environments play in the overall success of entrepreneurial institutions at universities or HEIs.

The investigation of the entrepreneurial motivation at universities and HEIs has demonstrated that the entrepreneurship educational program is of primary importance. Entrepreneurial education raises awareness among students and offers the university the possibility of familiarizing students with entrepreneurship and entrepreneurial opportunities. Therefore, the study clearly demonstrates the relevance of entrepreneurial education in motivating students right from the start. The present research work has also revealed that networking events contribute to the entrepreneurial motivation on campus, but they alone are not sufficient. An academic foundation must be built to create a motivational environment by raising awareness among the students.

Besides the organizational elements and structural components of entrepreneurial institutions at German universities and HEIs, the present research work also successfully contributed to a better understanding of various entrepreneurial support measures. The investigation of an incubator concept clearly revealed that an incubator is perceived as a support program mainly focused on early-stage start-ups displaying a foundational preparation. Therefore, the present research work indicated that the main objective behind an incubator is to successfully guide start-ups from the initial idea to the establishment of a solid business model right up to the official founding of a start-up. In comparison, the research findings indicated that an accelerator program mainly focuses on the strategic development of more advanced start-ups. Moreover, the results of this investigation reveal that an incubator program has fewer entry requirements, has no application process, and

lacks specific time limit compared to an accelerator program. Based on the research results, it is possible to conclude that an accelerator program follows a more linear path compared to an incubator program. The research study also revealed that terms such as makerspace or coworking space do not represent a support program or process but rather an open workplace that provides physical goods, for instance, materials, machinery, technologies, and physical space. Hence, the findings of the present research study complement those of earlier studies.

Although the findings of this research contribute to a better understanding of different entrepreneurial support measures, the results obtained confirm those of previous studies, which indicated the impreciseness of special terminology in the entrepreneurial support environment. The theoretical background already demonstrated the great variety of definitions and interpretations of incubators or makerspaces. Nevertheless, there is no standard, consistent, or theoretical definition. The present research work confirmed the overall confusion resulting from the missing preciseness of different terms. Even though some differences were evaluated, overall, the research findings present a clear tendency toward a more cautious use of these terms, especially in conjunction with the entrepreneurial institutions.

In general, the research findings demonstrated a positive resonance concerning the overall start-up ecosystem in Germany. The growing support environment and the significant corporate and institutional involvement provide constant reinforcement of the ecosystem. Nevertheless, besides existing financing gaps, the research results revealed high potential for improvement concerning the knowledge transfer mechanism between academia and industry. Such transfer enhances the overall innovation performance regionally as well as nationally. These findings suggest that, in general, the interconnection and the exchange between universities and HEIs with the corporate environment should be expanded.

To summarize, the research results contribute to the rapidly expanding field of entrepreneurship. The insights gathered throughout this study may be of assistance to obtain a better overview of the highly dynamic entrepreneurial support

environment. Therefore, the study contributes to the existing knowledge of the support environment at German universities and HEIs by providing significant organizational features, disclosing important factors contributing to the overall success, and expanding the understanding of various support measures. Hence, the present research work contributes in several ways to the literature on entrepreneurship and provides a basis for future research.

10. Outlook

Considering the limitations of the present research work, further research is required to provide a more holistic picture of the overall entrepreneurial support environment at German universities and HEIs. Therefore, more entrepreneurial institutions must be included in further research studies. Moreover, in consideration of the extremely dynamic nature of the overall ecosystem, continuous research is favorable.

Future research could also be extended internationally to gather a different perspective and to analyze various organizational structures and designs to identify new approaches. Considering the relatively small entrepreneurial ecosystem in Germany compared to other countries such as the United States, expanding the research could identify potential factors that are beneficial for the support environment at German universities or HEIs.

Additionally, to gather a more complete picture of the support environment at German universities and HEIs, and to analyze the overall entrepreneurial culture, it could be of interest to involve students in further research studies. A qualitative survey as well as qualitative interviews could be conducted to gain insights about students' awareness to analyze the overall entrepreneurial motivation and interest in such facilities. Therefore, the appropriateness of various support measures could be enhanced.

Besides analyzing organizational structures and support measures, future research is required to identify clear distinctions between them. The lack of conceptual clarity must be addressed to be able to clearly distinguish between specific terms such as makerspace, incubator, or accelerator. For this reason, to narrow the scope of interpretation and to obtain a more transparent overview of the support environment in Germany, future research is necessary to gather more precise definitions.

References

Adams, John (2014): Research methods for business and social science students. With assistance of Hafiz T. A. Khan, Robert Raeside. Second edition. Los Angeles: SAGE.

Balzat, Markus; Hanusch, Horst (2004): Recent trends in the research on national innovation systems. In *Journal of Evolutionary Economics* 14 (2), pp. 197–210. DOI: 10.1007/s00191-004-0187-y.

Bergek, Anna; Norrman, Charlotte (2008): Incubator best practice: A framework. In *Technovation* 28 (1/2), pp. 20–28. DOI: 10.1016/j.technovation.2007.07.008.

Bergner, Anne (2017): Make-Design-Innovate. Das Potential des Maker-Movements für Innovation, Kreativwirtschaft und Unternehmen. Hochschule für angewandte Wissenschaften Coburg. Coburg. Available online at https://www.researchgate.net/publication/323417044_Make-Design-Innovate_Das_Potential_des_Maker-Movements_fur_Innovation_Kreativwirtschaft_und_Unternehmen, checked on 10/22/2019.

Bone, J.; Allen, O.; Haley, C. (2017): Business Incubators and Accelerators: The National Picture. With assistance of Department for Business, Energy & Industrial Strategy. Nesta. England. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/608409/business-incubators-accelerators-uk-report.pdf, checked on 10/7/2019.

Bosma, Niels; Kelley, Donna (2019): Global Entrepreneurship Monitor. 2018/2019 Global Report. Global Entrepreneurship Research Association (GERA). Available online at https://www.gemconsortium.org/file/open?fileId=50213, checked on 12/10/2019.

Bundesministerium für Bidlung und Forschung (2017): Mehr Chancen für Gründungen. Fünf Punkte für eine neue Gründerzeit. Bundesministerium für Bidlung und Forschung (BMBF). Bonn. Available online at https://www.bmbf.de/upload_filestore/pub/Konzept_5_Punkte_Gruenderzeit_mit_IHV.pdf, checked on 5/4/2020.

Bundesministerium für Wirtschaft und Energie (2019): Das ist EXIST 2018. Zusammen.Zukunft.Gestalten. Bundesministerium für Wirtschaft und Energie (BMWi). Berlin. Available online at https://www.exist.de/SharedDocs/Downloads/DE/Mediathek/Das-ist-EXIST-2018.pdf?__blob=publicationFile, checked on 12/8/2019.

Cambridge Dictionary (2020). Cambridge University Press. Available online at https://dictionary.cambridge.org/, checked on 3/26/2020.

Carlsson, Bo; Jacobsson, Staffan; Holm é n, Magnus; Rickne, Annika (2002): Innovation systems: analytical and methodological issues. In *Research Policy* 31 (2), p. 233. DOI: 10.1016/S0048-7333(01)00138-X.

Chris Anderson (2012): Makers. The New Industrial Revolution. Crown Business. USA. Available online at https://www.fichier-pdf.fr/2013/10/30/makers-the-new-industrial-revolution-chris-anderson/makers-the-new-industrial-revolution-chris-anderson.pdf, checked on 10/5/2019.

Clark, Jennifer (2014): Manufacturing by Design: The Rise of Regional Intermediaries and the Reemergence of Collective Action. In *Cambridge Journal of Regions Economy and Society* 29. DOI: 10.1093/cjres/rsu017.

Dale Dougherty (2012): The Maker Movement. Innovations: Technology, Governance, Globalization,. MIT Press (3). Available online at https://www.mitpressjournals.org/doi/pdf/10.1162/INOV_a_00135, checked on 10/13/2019.

Dee, N.; Gill, D.; Weinberg, C.; McTavish, S. (2015): Startup Support Programmes. What´s the difference? . Nesta. England. Available online at https://media.nesta.org.uk/documents/whats_the_diff_wv.pdf, checked on 10/7/2019.

Dosi, Giovanni; Nelson, Richard R. (1994): An introduction to evolutionary theories in economics. In *Journal of Evolutionary Economics* 4 (3), pp. 153–172. DOI: 10.1007/BF01236366.

Dr. Marianne Kulicke (2014): 15 Years of EXIST "University-based start-up programmes". Development of the EXIST funding programme between 1998 and 2013. Fraunhofer-Institut für System- und Innovationsforschung ISI. Karlsruhe. Available online at https://www.exist.de/SharedDocs/Downloads/DE/15-years-EXIST-University-based-start-up-programmes.pdf?__blob=publicationFile, checked on 12/8/2019.

Edquist, Charles (1997): Systems of Innovation. Technologies, Institutions and Organizations. Edited by John de la Mathe. Routledge Taylor & Francis Group. England. Available online at https://charlesedquist.files.wordpress.com/2015/06/science-technology-and-the-international-political-economy-series-charles-edquist-systems-of-innovation_-technologies-institutions-and-organizations-routledge-1997.pdf, checked on 10/3/2019.

Edquist, Charles (2006): Systems of Innovation: Perspectives and Challenges. DOI: 10.1093/oxfordhb/9780199286805.003.0007.

Faltin, Günter (2018): Handbuch Entrepreneurship. With assistance of Günter 1944 Faltin, Muhammad 1940 Yunus. Wiesbaden: Springer Gabler (Springer Reference Wirtschaft). Available online at http://www.gbv.de/dms/zbw/844149985.pdf.

Freeman, Christoph (1987): Technology Policy and Economic Performance: Lessons from Japan. London, New York: Frances Printer Publishers.

Freeman, Christoph (1995): The 'National System of Innovation' in historical perspective. Campridge Journal of Economics. Available online at http://www.forschungsnetzwerk.at/downloadpub/1995_Freeman_NSI_historical_perspective.pdf, checked on 10/3/2019.

Gershenfeld, Neil (2012): How to Make Almost Anything. The Digital Fabrication Revolution. Foreign Affairs (6). Available online at http://cba.mit.edu/docs/papers/12.09.FA.pdf, checked on 10/24/2019.

Golichenko, O. G. (2016): The National Innovation System. In *Problems of Economic Transition* 58 (5), pp. 463–481. DOI: 10.1080/10611991.2016.1225452.

Gottschalk, Sandra; Lubczyk, Moritz (2019): Gründungen in Baden-Württemberg. Sonderauswertungen aus dem IAB/ZEW Gründungspanel. Zentrum für Europäische Wirtschaftsforschung (ZEW) Mannheim. Mannheim. Available online at https://www.zew.de/publikationen/gruendungen-in-baden-wuerttemberg/, checked on 11/24/2019.

Grimaldi, Rosa; Grandi, Alessandro (2005): Business incubators and new venture creation: an assessment of incubating models. In *Technovation* 25 (2), pp. 111–121. DOI: 10.1016/S0166-4972(03)00076-2.

Hackett, Sean M.; Dilts, David M. (2004): A Systematic Review of Business Incubation Research. In *The Journal of Technology Transfer* 29 (1), pp. 55–82. DOI: 10.1023/B:JOTT.0000011181.11952.0f.

Hagel, John; Brown, John Seely; Kulasooriya, Duleesha (2013): A movement in the making. A report by the Deloitte Center for the Edge. Deloitte University Press. Available online at https://deloitte.wsj.com/cfo/files/2014/02/MakerMovement.pdf, checked on 10/22/2019.

Hepp, Andreas (2018): What Makes a Maker? - Curating a pioneer community through franchising 7, pp. 3–18. DOI: 10.7146/ntik.v7i2.111283.

Hielscher, Sabine; Smith, Adrian (2014): Community-Based Digital Fabrication Workshops: A Review of the Research Literature. Science and Technlogy Policy Research (SWPS 2014-08). Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2742121, checked on 10/24/2019.

Klein, Malte; Sauer, Andreas (2016): Celebrating 30 years of Innovation System research: What you need to know about Innovation Systems. Univeristy of Hohenheim, Institute of Marketing and Management. Stutthart (Hohenheim Discussion Papers in Business, Economics and Social Sciences, 17). Available online at https://www.econstor.eu/bitstream/10419/147305/1/871710765.pdf, checked on 11/11/2019.

Kollmann, Tobias; Hensellek, Simon; Jung, Philipp Benedikt; Kleine-Stegemann, Lucas (2018): Deutscher Startup Monitor 2018. Neue Signale, klare Ziele. With assistance of KPMG in Deutschland. Bundesverband Deutsche Startups e. V. Available online at https://deutscherstartupmonitor.de/fileadmin/dsm/dsm-18/files/Deutscher%20Startup%20Monitor%202018.pdf, checked on 11/24/2019.

Kollmann, Tobias; Hensellek, Simon; Jung, Philipp Benedikt; Kleine-Stegemann, Lucas (2019): Deutscher Startup Monitor 2019. Mehr Mut, neue Wege. With assistance of PwC Deutschland. Bundesverband Deutsche Startups e.V. Available online at https://deutscherstartupmonitor.de/fileadmin/dsm/dsm-19/files/Deutscher_Start-Monitor_2019.pdf, checked on 11/24/2019.

Kollmann, Tobias; Stöckmann, Christoph; Hensellek, Simon; Kensbock, Julia (2017): Deutscher Startup Monitor 2017. Mut und Macher. With assistance of KPMG in Deutschland. Bundesverband Deutsche Startups e. V. (BVDS). Available online at https://deutscherstartupmonitor.de/fileadmin/dsm/dsm-17/daten/dsm_2017.pdf, checked on 11/24/2019.

Kostakis, Vasilis; Niaros, Vasilis; Giotitsas, Christos (2014): Production and governance in hackerspaces: A manifestation of Commons-based peer production in the physical realm? In *International Journal of Cultural Studies* 18 (5), pp. 555–573. DOI: 10.1177/1367877913519310.

Kuhlmann, Stefan; Arnold, Erik (2001): RCN in the Norwegian Research and Innovation System. Frauenhofer ISI and Technopolis Ltd. (Background report in the evaluation of the Research Council of Norway, 12). Available online at https://ris.utwente.nl/ws/files/15070352/RCN_in_the_Norwegian_Research_and_Innovation_Syste_1_.pdf, checked on 11/11/2019.

Kwon, Bo-Ram; Lee, Junyeong (2017): What makes a maker: the motivation for the maker movement in ICT. In *Information Technology for Development* 23 (2), pp. 318–335. DOI: 10.1080/02681102.2016.1238816.

Lewis, David A.; Harper-Anderson, Elsie; Molnar, Lawrence A. (2011): Incubating Success. Incubation Best Practices That Lead to Successful New Ventures. With assistance of National Business Incubation Association, University of Michigan, University at Albany. U.S. Department of Commerce Economic Development Administration. USA. Available online at http://edaincubatortool.org/pdf/Master%20Report_FINALDownloadPDF.pdf, checked on 10/5/2019.

Lundvall, Bengt-Åke (Ed.) (1992): National systems of innovation: towards a theory of innovation and interactive learning. London: Printer Publishers.

Lundvall, Bengt-Åke (1999): National Business Systems and National Systems of Innovation. In *International Studies of Management & Organization* 29 (2), p. 60. DOI: 10.1080/00208825.1999.11656763.

Lundvall, Bengt-Åke (2016): The Learning Economy and the Economics of Hope. Anthem Press. UK and USA. Available online at https://www.oapen.org/download?type=document&docid=626406, checked on 11/9/2019.

MAXQDA (2020). MAXQDA - Distribution by VERBI GmbH. Available online at https://www.maxqda.com/, checked on 4/11/2020.

Mayring, Philipp (2015): Qualitative Inhaltsanalyse : Grundlagen und Techniken. 12., überarb. Aufl. Weinheim Basel: Beltz. Available online at http://d-nb.info/1063369835/04.

Mian, Sarfraz A. (1994): US university-sponsored technology incubators: an overview of management, policies and performance. In *Technovation* 14 (8), pp. 515–528. DOI: 10.1016/0166-4972(94)90151-1.

Mian, Sarfraz A. (1996): Assessing value-added contributions of university technology business incubators to tenant firms. In *Research Policy* 25 (3), pp. 325–335. DOI: 10.1016/0048-7333(95)00828-4.

Moilanen, Jarkko (2012): Emerging Hackerspaces – Peer-Production Generation. Open Source Systems: Long-Term Sustainability. OSS 2012. IFIP Advances in Information and Communication Technology. Edited by Hammouda I., Lundell B., Mikkonen T., Scacchi W. Springer, Berlin, Heidelberg. Available online at https://link.springer.com/content/pdf/10.1007%2F978-3-642-33442-9_7.pdf, checked on 11/6/2019.

Mortara, Letizia; Parisot, Nicolas Gontran (2016): Through entrepreneurs' eyes: the Fab-spaces constellation. In *International Journal of Production Research* 54 (23), pp. 7158–7180. DOI: 10.1080/00207543.2016.1198505.

Nelson, Richard R. (1993): National Innovation Systems: A Comparative Analysis. New York.

Nelson, Richard R.; Winter, Sidney G. (1982): An Evolutionary Theory of Economic Change. THE BELKNAP PRESS OF HARVARD UNIVERSITY PRESS. USA. Available online at http://inctpped.ie.ufrj.br/spiderweb/pdf_2/Dosi_1_An_evolutionary-theory-of_economic_change.pdf, checked on 10/3/2019.

OECD (1997): National Innovation System. OECD Publications. Available online at https://www.oecd.org/science/inno/2101733.pdf, checked on 11/18/2019.

OECD (1999): Business Incubation. International Case Studies. OECD Publications Service. Paris. Available online at https://www.oecd-ilibrary.org/content/publication/9789264173781-en, checked on 9/14/2019.

Ribeiro-Soriano, Domingo (2017): Small business and entrepreneurship: their role in economic and social development. In *Entrepreneurship & Regional Development* 29 (1/2), pp. 1–3. DOI: 10.1080/08985626.2016.1255438.

Saunders, Mark (2012): Research methods for business students. With assistance of Philip Lewis, Adrian Thornhill. 6. ed. Harlow Munich u.a.: Pearson (Always learning). Available online at http://swbplus.bsz-bw.de/bsz356402258inh.htm.

Schmidt, Suntje; Ibert, Oliver; Kuebart, Andreas; Kühn, Juliane (2016): Open Creative Labs in Deutschland. Typologisierung, Verbreitung und Entwicklungsbedingungen. With assistance of Bundesministerium für Bidlung und Forschung. Forschungsabteilung Dynamiken von Wirtschaftsräumen- Leibniz-Institut für Raumbezogene Sozialforschung. Erkner. Available online at https://leibniz-irs.de/fileadmin/user_upload/Transferpublikationen/2017-Open_Creative_Labs_in_Deutschland-Typologisierung__Verbreitung_und_Entwicklungsbedingungen.pdf, checked on 11/21/2019.

Schön, Sandra; Ebner, Martin (2017): Von Makerspaces und FabLabs – Das kreative digitale Selbermachen und Gestalten mit 3D-Druck & Co. Handbuch E-Learning. Available online at https://www.researchgate.net/profile/Martin_Ebner2/publication/320851886_Von_Makerspaces_und_FabLabs_-_Das_kreative_digitale_Selbermachen_und_Gestalten_mit_3D-Druck_Co/links/59fde2670f7e9b9968c355a8/Von-Makerspaces-und-FabLabs-Das-kreative-digitale-Selbermachen-und-Gestalten-mit-3D-Druck-Co.pdf, checked on 10/5/2019.

Schumpeter, Jospeh A. (1942): Capitalism, Socialism, and Democracy. Harper & Brothers Publishers. USA. Available online at https://ia801602.us.archive.org/33/items/in.ernet.dli.2015.190072/2015.190072.Capitalism-Socialism-And-Democracy.pdf, checked on 11/14/2019.

Schumpeter, Jospeh A. (1949): The Theory Of Economic Development. An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. Harvard University Press. USA. Available online at https://ia801601.us.archive.org/0/items/in.ernet.dli.2015.187354/2015.187354.The-Theory-Of-Economic-Development.pdf, checked on 11/14/2019.

Seno Wulung, R. B.; Takahashi, Katsuhiko; Morikawa, Katsumi (2018): A model for selecting appropriate technology for incubator-university collaboration by considering the technology transfer mechanism. In *International Journal of Production Research* 56 (6), pp. 2309–2321. DOI: 10.1080/00207543.2017.1374569.

Sharif, Naubahar (2006): Emergence and development of the National Innovation Systems concept. In *Research Policy* 35 (5), pp. 745–766. DOI: 10.1016/j.respol.2006.04.001.

Stahlecker, Thomas; Lo, Vivien (2004): Gestaltungsmöglichkeiten von Gründerräumen und Inkubatoren an der Hochschule. Fraunhofer-Institut für Systemtechnik und Innovationsforschung. Karlsruhe. Available online at https://www.exist.de/SharedDocs/Downloads/DE/Studien/Gestaltungsmoeglichkeiten-Gruenderraeumen-Inkubatoren-Hochschule.pdf?__blob=publicationFile, checked on 11/24/2019.

Sternberg, Rolf; Wallisch, Matthias; Gorynia-Pfeffer, Natalia; Bloh, Johannes von; Baharian, Armin (2019): Global Entrepreneurship Monitor Unternehmensgründungen im weltweiten Vergleich. Länderbericht Deutschland 2018/19. RKW Rationalisierungs- und Innovationszentrum der Deutschen Wirtschaft e. V. Available online at https://www.gemconsortium.org/file/open?fileId=50256, checked on 12/11/2019.

Tidd, Joseph, 1960- (2013): Managing innovation : integrating technological, market and organizational change. With assistance of John R. 1952 Bessant. 5. ed. Chichester u.a.: Wiley. Available online at http://swbplus.bsz-bw.de/bsz37506401Xinh.htm.

Troxler, Peter (2010): Commons-Based Peer-Production of Physical Goods: Is There Room for a Hybrid Innovation Ecology? In *SSRN Journal*. DOI: 10.2139/ssrn.1692617.

Troxler, Peter (2016): Fabrication Laboratories (Fab Labs). In, pp. 109–127. Available online at https://www.researchgate.net/publication/303182688_Fabrication_Laboratories_Fab_Labs, checked on 10/24/2019.

van Holm, Eric Joseph (2015a): Makerspaces and Contributions to Entrepreneurship. In *Procedia - Social and Behavioral Sciences* 195, pp. 24–31. DOI: 10.1016/j.sbspro.2015.06.167.

van Holm, Eric Joseph (2015b): What are Makerspaces, Hackerspaces, and Fab Labs? In *SSRN Journal*. DOI: 10.2139/ssrn.2548211.

van Holm, Eric Joseph (2017): Makerspaces and Local Economic Development. In *Economic Development Quarterly* 31 (2), pp. 164–173. DOI: 10.1177/0891242417690604.

Warnke, Philine; Koschatzky, Knut; Dönitz, Ewa; Zenker, Andrea; Stahlecker, Thomas; Som, Oliver et al. (2016): Opening up the innovation system framework towards new actors and institutions. Fraunhofer ISI Discussion Papers. Karlsruhe (Innovation Systems and Policy Analysis, 49). Available online at https://www.isi.fraunhofer.de/content/dam/isi/dokumente/cci/innovation-systems-policy-analysis/2016/discussionpaper_49_2016.pdf, checked on 11/11/2019.

Wolf-Powers, Laura; Doussard, Marc; Schrock, Greg; Heying, Charles; Eisenburger, Max; Marotta, Stephen (2017): The Maker Movement and Urban Economic Development. In *Journal of the American Planning Association* 83 (4), pp. 365–376. DOI: 10.1080/01944363.2017.1360787.

Zinke, Guido; Ferdinand, Jan-Peter; Groß, Wolfram; Möring, Janik Linus; Nögel, Lukas; Petzolt, Stefan et al. (2018): Trends in der Unterstützungslandschaft von Start-ups – Inkubatoren, Akzeleratoren und andere. With assistance of Bundesministeriums für Wirtschaft und Energie (BMWi). Institut für Innovation und Technik in der VDI/VDE Innovation + Technik GmbH. Berlin. Available online at https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/trends-in-der-unterstuetzungslandschaft-von-start-ups.pdf?__blob=publicationFile&v=10, checked on 11/21/2019.

Appendix

Appendix A │Expert Interview

a. Interview Guide German

Facility Name:

University/HEI:

Place:

Date:

Interview Style:

Start Time:

End Time:

Interviewee:

Position of Interviewee:

Interviewer:

Fragen zur Einrichtung:

1. Besitzen Sie einen umfassenden Bewerbungsprozess, oder ist Ihre Einrichtung zugänglich für alle Start-ups und Entrepreneurs?

2. Wie viel Start-ups unterstützen Sie durchschnittlich?

3. Kann Ihre Einrichtung zeitlich unbegrenzt von den Start-ups oder Entrepreneurs genutzt werden? Wenn ja, wie lange wird Ihre Einrichtung durchschnittlich von den Start-ups genutzt?

4. Welchen Service bieten Sie Ihren Start-ups an? (Training, Mentoring, Management Unterstützung, Erstellung von Business Models etc.)

5. Welches Equipment steht den Start-ups in Ihrer Einrichtung zur Verfügung?

6. Müssen Start-ups oder Entrepreneurs eine Gebühr/Miete bezahlen um Ihr Equipment/Service nutzen zu können oder ist diese kostenfrei? Wenn ja, wie hoch fällt diese Gebühr in der Regel aus?

7. Haben Sie einen speziellen Fokus auf eine Branche gelegt (IT, Business etc.) oder unterstützen Sie alle Start-ups unabhängig der Branche oder Fachrichtung?

8. Welche Start-up Phase unterstützen Sie in Ihrer Einrichtung? (Early-Stage Start-ups etc.)

9. Wie viele Mitarbeiter sind in Ihrer Start-up Betreuung aktiv?

10. Wie trägt sich Ihre Einrichtung? Werden Sie finanziell gefördert? Wenn ja, öffentliche Unterstützer (Staatlich) oder private Unterstützer (Unternehmen)? Wenn nein, wie finanziert sich Ihre Einrichtung? (durch Forschungsaufträge von Unternehmen, integrierte Sub-Unternehmen, Kooperationen mit diversen Unternehmen/Spin-offs, Verkauf von Entwicklungen/ Forschungen/ Innovationen?)

11. Kooperiert Ihre Einrichtung mit anderen Inkubatoren oder allgemein mit anderen Universitäten oder Hochschulen?

Spezifische Fragen:

1. Ein immer größer werdendes Angebot an Unterstützungsmaßnahmen macht es schwer sämtliche Begrifflichkeiten, z.B. Makerspace, Hackerspace, Akzelerator, Inkubator etc. zu unterscheiden. Mit welcher Begrifflichkeit würden Sie sich identifizieren und wieso?

2. Was assoziieren Sie mit dem Begriff Inkubator und was macht Ihrer Meinung nach ein Inkubatoren-Konzept an Hochschulen oder Universitäten erfolgreich?

3. Der Deutsche Start-up Monitor führt Sie als einer der 10 besten Start-up-Universität/Hochschule Deutschlands. Was unterscheidet Ihre Einrichtung von anderen? Und was macht Ihre Einrichtung so erfolgreich?

4. Haben Sie Entrepreneurship fest in Ihren Lehrplan und an Ihrem Campus durch diverse Veranstaltungen integriert? Sind Sie der Meinung, dass dadurch die Gründungsmotivation an Ihrem Campus gesteigert wird?

5. Welche Trends haben sich in Bezug auf Gründungsideen in Ihrer Einrichtung in den letzten Jahren herauskristallisiert?

6. Viele Start-ups und Entrepreneur sehen das Start-up-Ökosystem in Deutschland als gut und solide an. Sehen Sie das genauso? Und welche Bereiche sollten Ihrer Meinung nach noch verbessert werden?

b. Interview Guide English

Facility Name:

University/HEI:

Place:

Date:

Interview Style:

Start Time:

End Time:

Interviewee:

Position of Interviewee:

Interviewer:

Questions associated with the facility:

1. Is your institution accessible for all start-ups and entrepreneurs or only after going through a comprehensive application process?

2. How many start-ups do you support, on average?

3. Is your institution accessible for an indefinite period of time, or does it possess a specific time limit? Unlimited, how long do start-ups normally remain part of the institution?

4. What type of entrepreneurial service does your institution offer (training, mentoring, management support, business models design, etc.)?

5. What type of equipment does your institution provide to start-ups or entrepreneurs?

6. From a financial point of view, is the institution freely available for all start-ups and entrepreneurs or only after paying a respective rental fee or utilization fee? If yes, how much do they need to pay?

7. Do you support every start-up regardless of the industry, or does your institution focus on a particular industry sector (IT, business, etc.)?

8. Which start-up stage does your institution mainly support (early-stage start-up, etc.)?

9. How many employees actively support or coach start-ups in your institution?

10. How is your institution organized financially? Does your facility receive any type of financial support or funding? If yes, is it public funding (governmental subsidies) or private funding (company)? If no, how is the institution financed (through research contracts with companies, integrated sub-companies, cooperation with companies/spin-offs, selling specific developments/research/innovation)?

11. Does your facility collaborate with other incubators at universities, or in general with other universities or HEIs?

Specific questions:

1. The ever-growing support environment makes it difficult to clearly define and distinguish terms such as makerspaces, hackerspaces, accelerators, or incubators. With which term would you identify your institution and why?

2. What do you associate with the term incubator? In your opinion, what makes an incubator concept at universities or HEIs successful?

3. According to the study of the German Start-up Monitor, your institution has been rated among the 10 best entrepreneurial universities/HEIs in Germany. What distinguishes your institution from others? What makes your institution so successful?

4. Has your university/HEI fully integrated entrepreneurial education into the core curriculum, and does your university/HEI offer various entrepreneurial events? Do you believe this increases the overall entrepreneurial motivation on campus?

5. During recent years, what type of trends or areas have influenced start-ups or entrepreneurs at your institution?

6. Many start-ups and entrepreneurs evaluate the German start-up ecosystem positively and solidly. Do you agree with this statement? In your opinion, which areas still need to be improved?

c. Declaration of Consent

Einwilligungserklärung zur Erhebung und Verarbeitung personenbezogener Interviewdaten

Forschungsprojekt:	Masterarbeit
Forschungszweck:	Wissenschaftliche Studie über Startup Zentren an deutschen Universitäten und Hochschulen
Durchführende Institution:	HFU Business School Jakob-Kienzle-Straße 17, 78054 Villingen-Schwenningen
Interviewerin/Interviewer:	Lisa-Marie Merkel (lisa.merkel@hotmail.de)
Interviewdatum:	

Hiermit willige ich ein, dass im Rahmen des beschriebenen Forschungsprojekts Daten meiner Person erhoben und ausgewertet werden. Die Ergebung erfolgt durch Audioaufnahmen/Fragebögen/Protokolle, die in der Folge transkribiert, anonymisiert und für wissenschaftliche Analysen und daraus hervorgehende Veröffentlichung auszugsweise verwendet werden.

Über Art und Umfang von Ergebung und Auswertung wurde ich mündlich und in der schriftlichen Anlage zu dieser Erklärung umfassend informiert.

Ihre Einwilligung ist freiwillig. Sie können die Einwilligung ablehnen, ohne dass Ihnen dadurch irgendwelche Nachteile entstehen. Ihre Einwilligung können Sie jederzeit gegenüber der durchführenden Institution widerrufen. Die weitere Verarbeitung Ihrer personenbezogenen Daten wird ab diesem Widerruf unzulässig. Dies berührt jedoch nicht die Rechtmäßigkeit der aufgrund der Einwilligung bis zum Widerruf erfolgten Verarbeitung.

Ich bin damit einverstanden, im Rahmen des genannten Forschungsprojekts an einem Interview/ an mehreren Interviews teilzunehmen.

☐ja ☐nein

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Vorname, Nachname in Druckschrift

_____

Ort, Datum / Unterschrift

Appendix B │Qualitative Content Analysis

a. Coding Guideline

Main Category	Definition	Prime Example	Coding Rule
C1: Accessibility	Specific requirements concerning the access criteria of entrepreneurs and start-ups in the respective facility.	**Application procedure** *"You have to go through an application process."* *(I3, Pos. 6)* **Admission Charges** *"No. In general, the program we offer is free of charge."* *(I2, Pos. 47)* **Time limits** *"They can stay as long as they want." (I1, Pos. 34)* **Industry factors** *"All start-ups, regardless of the origin, the subject, and what they want to do." (I6, Pos. 86)* **Start-up development phase** *"But we actually support all stages, all start-up stages." (I2, Pos. 61)*	Entry criterion for start-ups and entrepreneurs in terms of: • Application Procedure • Admission Charges • Time Limits • Industry Factors • Start-up Development Phase
C2: Offered Service	Support services offered by the respective facility focusing on delivering value, knowledge, and expertise to the start-ups and entrepreneurs through direct user involvement.	*"Yes, coaching, access to capital, office space, individual topic coaching so you know according to, like let's stay broken down by marketing, finance*." (I3, Pos. 12)	Intangible goods provided to the respective start-up or entrepreneur through interpersonal communication, specific activities or, teaching practices.

C3: Equipment	Available material, machinery, technical appliances, and physical space at the respective facility.	*"Yes, we offer a coworking space including office supplies and the whole infrastructure, so printer, server capacity." (I8, Pos. 34)*	Physical goods. Tangible properties provided to start-ups and entrepreneurs.
C4: Organizational Elements	Main characteristic of the overall operational and organizational structure of the respective facility.	**Organizational Identification** *"Generally speaking, as a center. It is the most non-committal form. For instance, entrepreneurship center. With this you can be everything or nothing, and that is exactly the reason why." (I1, Pos. 159)* ***Financial Structure*** *"We are financially supported through budget funds and won the competition named Excellent Start-up Center, and are now also being financially supported by the state." (I6, Pos. 106)* ***Collaborations*** *"Yes. Three other universities." (I3, Pos. 44)* **Employees (Start-up Coaching)** *"Last year we had one coach, today [...] we have two and a half coaches additionally to me [...]." (I6, Pos. 102)* ***Average number of start-ups supervised*** *"15 every 6 months." (I3, Pos. 8)*	Characteristics influencing institutional activities, tasks, and operations such as: • Organizational Identification • Financial Structure • Collaborations • Employees (Start-up Coaching) • Average Number of Start-ups Supervised
C5: Entrepreneurial Motivation	Entrepreneurial events driving entrepreneurial motivation on campus.	*"I think that things that increase [...] the interest in entrepreneurship at the university are more like the events, like the center runs." (I3, Pos. 54)*	Individual assessment by the respective respondent concerning entrepreneurial motivation on campus through academic lectures and/or through entrepreneurial events.

C6: Uniqueness and Critical Success Factors	Crucial success factors as well as unique features contributing to the overall success of the respective facility.	*"It is also important who works at the incubator. Personally, I would say it's recommendable to have external people working in an incubator, not only people from the university, to enable the transfer with the economy at an early stage, to possess a considerable network [...].In my opinion, that is what makes it successful [...]." (I5, Pos. 39)*	Key factors named by the respondents driving the success and determining the uniqueness of the respective facility.
C7: Start-up Trends	Main thematic areas and subjects that influence entrepreneurial ideas and induce start-up formations.	*"I mean, certainly the megatrends are all [...] hitting the institution so there is you know obviously things like artificial intelligence, big topics like mobility. Certainly, topics like robotics [...] are coming up." (I3, Pos. 56)*	Specific thematic fields influencing new business formations perceived by the respondents at the respective facility.
C8: Characteristics of an Incubator at Universities and HEIs	Comprehension and personal definition of the word "incubator" as well as driving factors at universities and HEIs.	*"An incubator represents a 'breeding place' for start-ups with a small idea. We want to transfer and develop the initial idea into a solid business model comprising, for instance, a strategic business plan. That is what we understand under the term incubator." (I6, Pos. 116)*	Personal understanding and image of the respondents concerning the expression and implementation of an incubator at universities and HEIs.
C9: Perception of the German Start-up Ecosystem	Personal viewpoints concerning the overall German start-up ecosystem.	*"Start-ups and entrepreneurs consider the German start-up ecosystem as a solid and good working system; I would definitely not agree with that statement." (I2, Pos. 157)* *"[…] I think start-ups struggle with the administrative side and with the administrative effort." (I2, Pos. 159)*	Positive as well as negative aspects regarding the German start-up ecosystem perceived by the respondents.